SPAIN: A Bloody Proving Ground!

JANUARY 25c

POPULAR AVIATION

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Jan-Dec-
1938

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IS STATIC THE KILLER?

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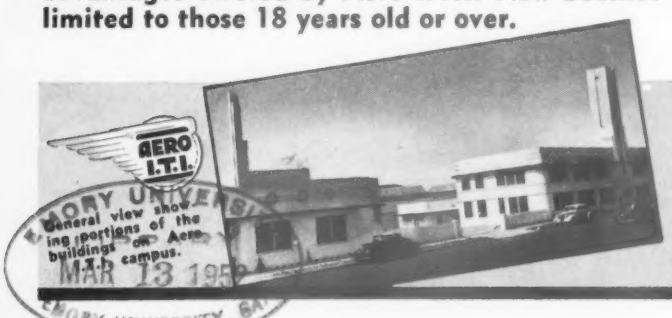

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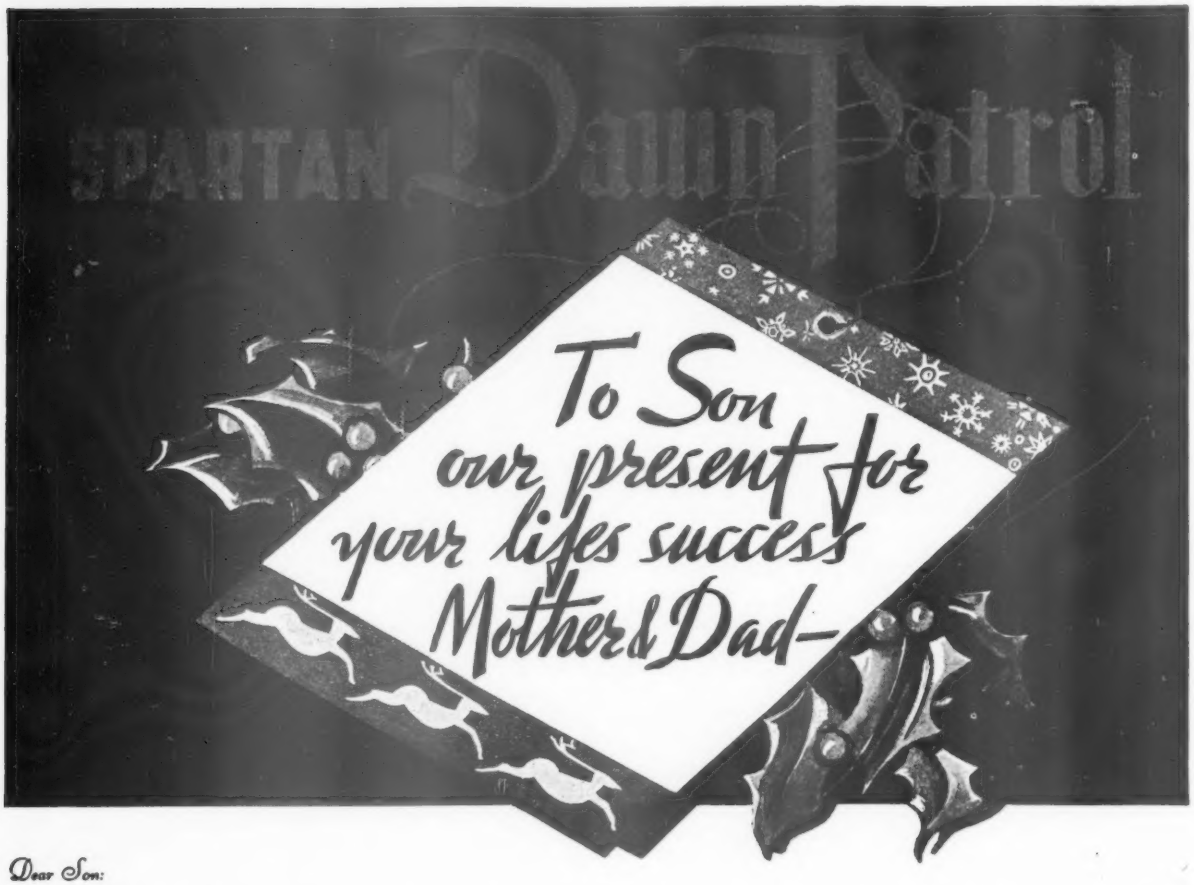

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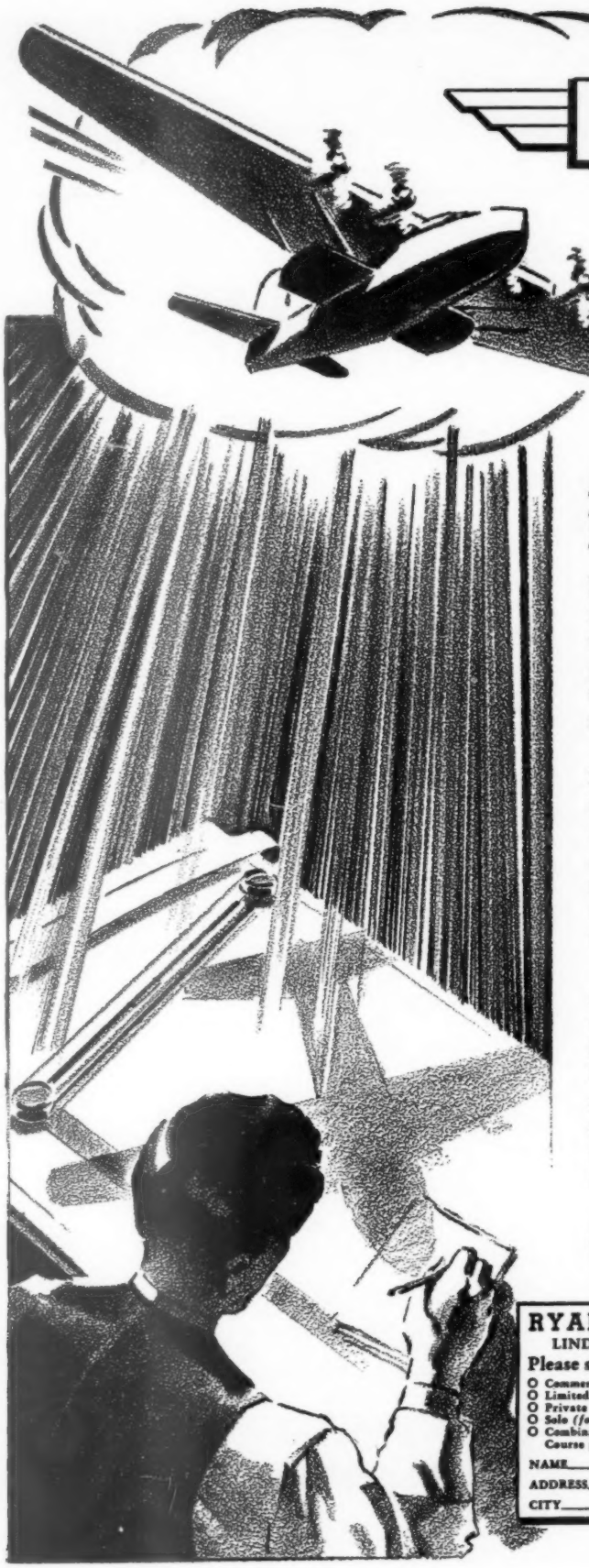

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An Airy Chat with the Editor

WELL, here we are again, but amid new surroundings and on the next page, snuggling up against the table of contents. However, if we do half as well over here as we did in our old location we will be well pleased and properly grateful to our old friends.

In spite of our recent jump of 96 pages, we are still crowded for room to accommodate our many new features, hence the Airy Chat, Swanee Taylor, the National Air Board and the Man Under the Hood are being compressed into narrower limits. Do you, our old readers, realize that ole P. A. is 50-percent larger than it was only two short years ago?

* * *

THERE are several reasons for our steady growth, even during the depression, but the principal reason and the one for which we extend our heartfelt thanks is the loyality of our readers. We have spoken of this loyalty many times, and the personal interest taken by thousands of our readers in POPULAR AVIATION, but here you see the practical culmination of this loyalty in a bigger, better and more comprehensive magazine. We have both benefited by this great interest and friendliness.

* * *

YOU will find, in this issue one of the most remarkable and revolutionary analyses of aircraft accidents yet proposed. It is the electrostatic theory advanced by Mr. Leake, instructor in the Crane Technical High School of Chicago and it merits your most careful study and consideration.

The author's familiarity with the effect of electrostatic charges and distribution, insures the basic truth of the material from a purely electrical standpoint. The only undetermined factor is the exact expression of the magnitude of the charges existing on the skin of an airplane, but even this factor can be closely approximated by computation

(*Continued on Page 86*)

POPULAR AVIATION

Including SOUTHERN AVIATION and AERONAUTICS

Volume XXII JANUARY, 1938 Number 1

FOR THE PROMOTION OF PRIVATE FLYING AND COMMERCIAL AVIATION

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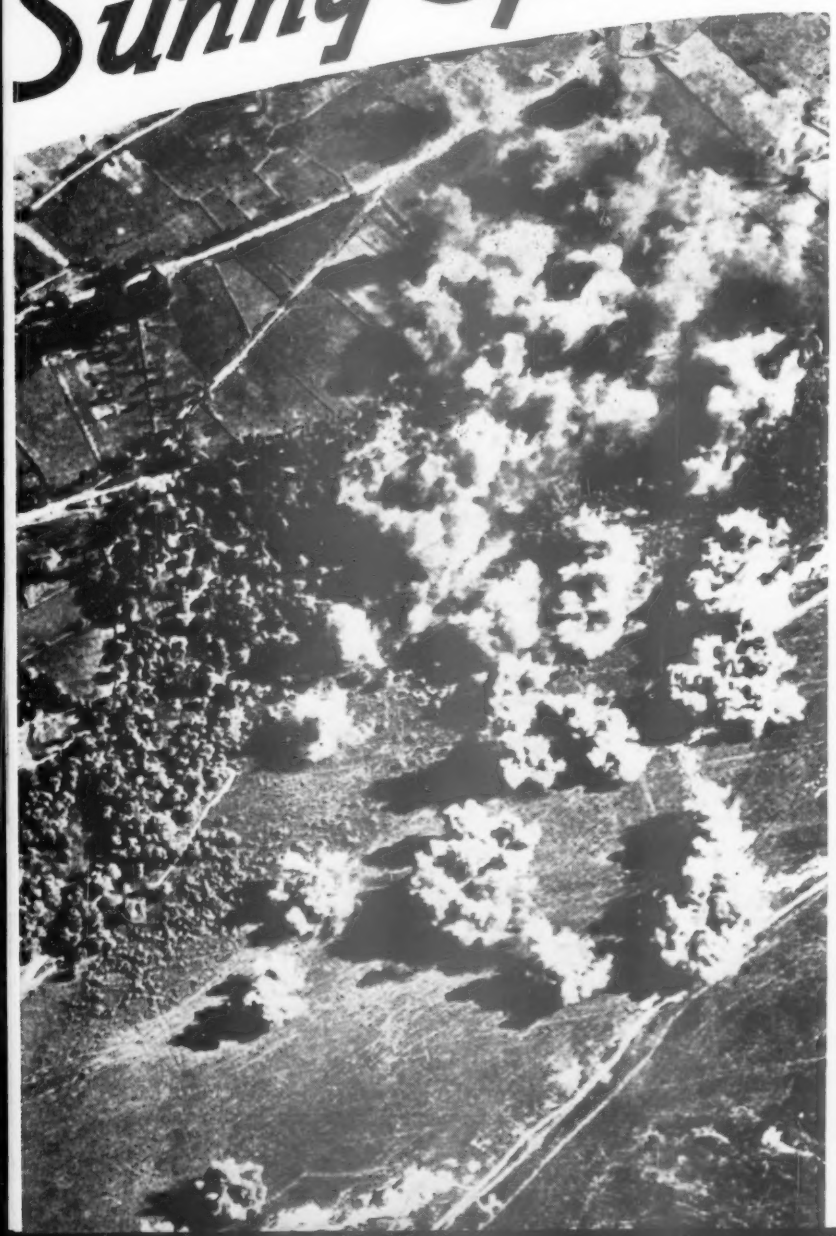
By
FREDERIC B. ACOSTA

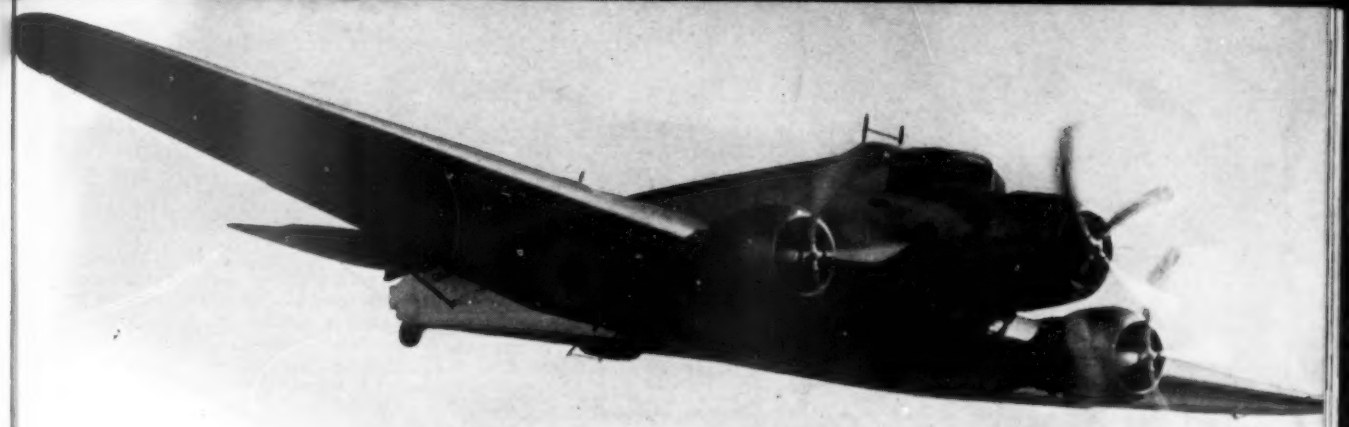
Here is the story of what ruthlessness in the air has done to Spain. The author, an international journalist and cousin of famed Bert Acosta, tells of the holocaust.

Sunny Spain—A



IT is the airplane—the intensely developed war weapon since the World War—that is spreading death and desolation over all Spain. The plane has revolutionized war. It is not a mere military weapon like a cannon, a rifle, a battleship. Now it is considered, as the air demonstrations in Spain prove, as the most effective arm of the new technique. It is the most persuasive instrument of the dictator to carry terrorization and frightfulness not only to the enemy camp but to distant regions as well.

The ruthless and methodical bombing and extermination of women, children and the aged of Guernica, the ancient capital of the Basque provinces in northern Spain, by German warplanes two months ago, shocked the civilized world. This murderous bombing and machine-gunning of civilian population in the Basque towns by the rebel planes provoked indignation and disapproval



Italy donated Savoia bombers "to the cause."

BLOODY PROVING GROUND

among the military opinions of the world.

I shall cite here a graphic example of a thorough job of annihilation of both life and property made by a modern plane bomber. I refer to the total destruction of Guernica in northern Spain by German warplanes fighting on the Spanish insurgent side.

The havoc wrought in this event exceeded the imagination and shocked both military and non-military world—it was typical of the ruthless and inhumane methods employed by the German and Italian aviators serving under insurgent General Franco.

The facts, as nearly as I have been able to find, are as follows: When the squadrons of bombers set out for Guernica from the German airdrome at Deva in Northern Spain, their crews had orders to carry out the most methodical destruction of life and property since Louvain was razed in the World War.

First, they dropped the explosive bombs to wreck the houses and buildings, then dropped the aluminum incendiary bombs to fire the debris. The inhabitants, who survived explosion and fire, were then machine-gunned as they tried to escape. A captured German pilot told the following: *"My orders were to machine-gun from my plane anything moving."* And so the German crews have had fun swooping down and machine-gunning the defenseless civil population.

The destruction of Guernica and the bombing and burning of Durango, Eibar, Arbacegui, Arteaga and three or four other places, were attacked by three types of German bombers, of which the Junkers Ju-52 and the Heinkel 51 are known to have been in action since last year, but the German light bomber He-111 first appeared in Spanish skies early last April. In Spain the great Junkers bombers are called *pajaros negros* after the black birds which the Spaniards know so well.

The real truth is that the civil war in Spain is, in a sense, a European war on a small scale. The Russians and the French are actually fighting Italians and Germans, though in a minor way.

Even here in America we nourish fears that these small scale operations in Spain, today, will inevitably drift into large-scale operations in the future. Some observers believe that in two years there would be another European conflagration of the deadliest sort. Unhappy anticipations of the next war are felt keenly in large countries of Europe. Great Britain has made a sudden decision to build a formidable air force. France is reforming and expanding her air armada and is spending billions of francs for this purpose. Russia, unquestionably, has a superior air force at the present time.

Spain, at the outset of her trouble over a year ago last July, was the least of Europe's air powers. She had only 162

"Practicing" German airmen flying German bombers used this little corner of Spain for a test-tube. That's a direct hit on the building corner.

ITALIAN bombs in an Italian bomber — for Spain.

planes, some of which could not match the best of the German's or Russian's. When the rebellion began, the Spanish government had difficulty in keeping her air force intact. More than half of that number had either been flown to the rebel camp, had been wrecked or sabotaged during the first few weeks after the civil war started.

Then, in a twinkling of an eye, there appeared in the Spanish skies every class and make of the latest and best European military planes fighting either for the government or the rebel side.

Russian and French pilots, flying their respective national planes, swiftly and efficiently, scoured the enemy's trenches and camps while, from the rebel lines, one could see three and four-motored Italian Breda and Caproni bombers, German Junkers and Heinkel bombers and the light bomber He-111 roaring into battle.

French war planes in Spain are the best known. They are the Breguet, Bleriot-Spad, Nieuport, Dewoitine, Loire, Hanriot and Bloch. In the language of a French technician, they are carrying the best work of France's warplanes into the great test.

The Russian "Chato," according to a foreign military observer in Spain, is the fastest and most maneuverable pursuit ship.

Modern fighting planes have been greatly improved in speed and swiftness. The speed range of modern bomber is between 200 and 250 m.p.h., while a pursuit ship flies between 250 and 350 m.p.h.

German warplanes are reaching the Spanish rebel's territory in larger numbers. Two or three months ago, Germany established a direct airline to Burgos, Spain (city held by rebel forces). This Nazi airline, though primarily organized as a business venture, is merely a subterfuge for passing warplanes from Germany into Spain.

It is a matter of record that, in one departure, there were 40 German planes in a single night flight. Planes are said to leave Hanover, Germany, regularly between 11 p. m. and midnight, flying over France at 12,000 to 15,000 feet high with their lights out.

Messages from various sources point to the departure of a continual stream of Italian airplanes for the Spanish rebel forces.

These foreign flyers on both sides are deadly earnest and seriously determined to fight the enemy. Beside the Russian and French pilots on the loyalists' side there is a great number of British and American flyers serving the Spanish government. The Italian and German aviators compose rebel General Franco's air force.

The rule is for these foreign aviators to fly and fight in the planes from their respective countries. The Italians and Germans have their own airdromes; they have their respective mechanics, their own commanders, wear their national uniforms and eat in the exclusive messes.

A foreign journalist observed that German aviators do not mingle freely with Italian flyers and no interchange of experiences have passed between a German pilot and an Italian flyer except through formal statements from the commanders themselves.

Civilians are strictly prohibited from coming near the airdromes or engaging in conversation with any pilot. If they violate this rule they will be arrested as spies. This rule also applies to foreign correspondents and, if any journalist attempts questioning the pilots, he is instantly arrested.

Photographers are banned from air bases and this is the reason why we in America, do not see closeup pictures of these European wings of destruction doing their work in the Spanish peninsula.

As a foreign writer puts it: "The foreign pilots serve both sides, under secrecy, and they obey only the voice of their dictator."

Generalissimo Francisco Franco and his German and Italian advisers believe that aerial terrorism is of great importance to insure victory. They believe that, by bombing industrial centers and the civilian population, they undermine the morale of the inhabitants and thus will cause the loyalists to surrender earlier.

The rebel plane squadrons freely bomb the parks, market places and other centers of civilian population where noncombatants are likely to be gathered. The rebel aviators avoid attacking munition plants and trenches where anti-aircraft defenses are effective.

The inhumane bombing of defenseless civil population gives you the impression that there is no sure defense against a campaign of terror from the skies, against the attack of super-bombers in vast murderous flights. The civilized world recognized it in the destruction of Guernica and even Gen. Franco deplored it.

It is now reliably reported that the number of actual soldiers killed on both sides in battles, since the Spanish civil war began over a year ago last July, is very small in comparison with countless thousands of civilian victims massacred, the women, children and the aged.

Thousands have been slaughtered by irresponsible machine-gunning, mangling by shrapnel and run over by tanks. On top of all this, the brutalities of the semi-barbarous Moorish troops brought into Spain by Gen. Franco from Spanish Morocco in northern Africa, are creating further disaster because they are given free license by the rebel commanders in towns they have captured.

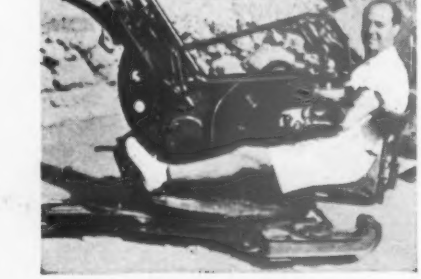
These savage Moroccans are perpetrating most ghastly crimes, attacking women and girls and massacring the aged with bayonets. And General Franco seems to condone the crimes of these hordes of Moors.

The destruction of the old Basque capital of Guernica in northern Spain by German bombers shocked both the military and non-military world. It was the first test of air power on a large scale.

European military authorities were greatly disturbed by this appalling event. London, Paris, Berlin and other great continental cities are laying foundations

(*Continued on Page* 78)

GERMAN one-man anti-aircraft guns are also used in Spain.



RUSSIAN tanks like the gutted one above also are a part of the "Spanish" war. Its powerful cannon failed to keep its crew from being slaughtered.

Matt Berry and Frank Hartley (above) rescued Lt. Sheldon Coleman (left) and Aircraftsman Joseph Fortey (right) in wild northern Canada.

Lost in Canada's Barren Lands

by E. L. F. McLEOD

LITTLE is generally known about the far Canadian northland—that land which hugs the Arctic Ocean. While the Canadian government is striving to perfect maps of this undeveloped country that we, the reading public, might have a wider knowledge, we little dream of the hardships endured or the difficulties faced by the men who penetrate this new land.

The following is a true story, which grew out of this map-making business, based on a recent experience of a group of surveyors and two young airmen. . . .

It was on August 13 of the past summer that a call for help went out on the ether. One of a group of eight airplanes of the Royal Canadian Air Force, sent into the Barren Lands for the purpose of mapping it, was in trouble. Flight Sergt. Hornby had been forced down on a little unknown lake due to engine failure, and for some hours was completely lost to his companions. As soon as he was located, word was sent out to rush a new engine in for Hornby's plane and Flight Lieut. Sheldon Coleman of Winnipeg, with his air engineer, Joseph Fortey, was assigned the duty of delivering it.

The Barren Lands, as this area is so aptly named, lies west of the Hudson Bay, just north of the prairie provinces, and covers an area of approximately 450,000 square miles. It is bordered on the north by the Arctic Ocean, and on the other three sides by a fringe of small trees. There is no growth of any account on this huge stretch of land except the short leathery grass or caribou moss, interspersed by patches of bitter Barren Land berries which grow close to the ground, a few cranberries and blueberries, and a small clump of timber along the Thelon River. Eighty per cent of this 450,000 square miles is water, in a variety of shapes, including lakes, streams, and even puddles, where flies and mosquitoes breed in profusion during the short summer season.

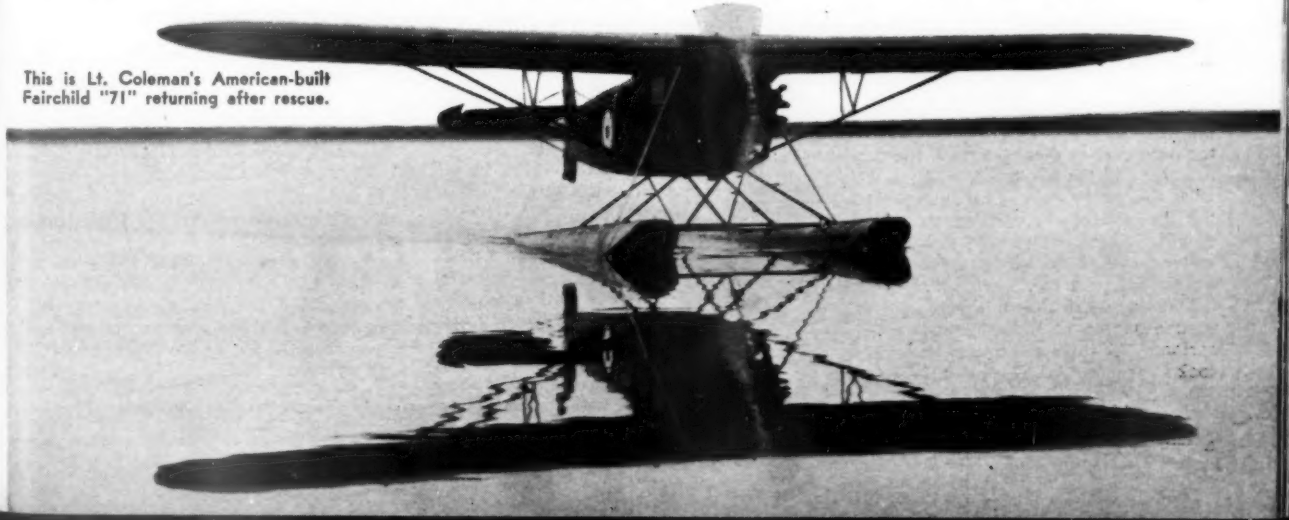
Picture this vast, almost desert-like, area with no landmarks for guidance, and you will have a slight conception of the risk these men are forced to face in order to gain their objective.

And so it was back over the passage from Edmonton to Fort Reliance, some 900 miles north, that these two young men directed their American-made Fairchild "71," carrying a new engine, and supplies for the journey back to their base.

While orders, from headquarters at Ottawa are to carry ample supplies for emergency, as well as a rifle and other necessities for a forced landing, the weight of the new engine so greatly increased the load that the men were forced to take out all but the most meagre supply of food and hope for the best.

Their flight out to Fort Reliance and out to where Hornby was stranded was uneventful and after loading the old engine they started back. Going out, they had used as their landmarks the Great Slave Lake and a chain of smaller lakes (known as the Artillery Waterways) leading from it. Returning, however, they were unable to locate this lake chain due to a storm. Their compass failed to work with the old engine resting beside it and, left to their own judgment, they flew miles off their path.

With their gas tank registering low they decided to land on the little lake which later proved to be Lac de Gras. They knew now that they were lost. At best, they could remain in the air less than an hour. Thinking the situation over, they concluded there might be something



This is Lt. Coleman's American-built Fairchild "71" returning after rescue.

gained by traveling as far as they could, so before leaving they tied a note to an empty gasoline drum, stating that they intended continuing south for 30 minutes before landing, as they had only enough gas to last an hour. When they took off, they little knew they were heading due west, so completely lost were they. In about 20 minutes' time they turned a little more to their right, toward the timber line, their chief concern, now, being to assure themselves of a landing place where they might have fuel for a fire.

Coming down between an island and the mainland, on what they were to learn later was Point Lake, the flyers moored their plane to an open stretch of shore line, and then went to work to set up camp for an indefinite length of time. While the nearest clump of trees was three miles back, they chose to set up their small tent near the lake shore, that it might be more easily seen from the air; but the many trips back and forth, for tent poles and their fire wood will, no doubt, be an everlasting memory.

With tent pitched, and furnished with bed rolls and an empty gasoline drum for an improvised stove, they portioned out their rations. By exercising the strictest economy, these were made to last 22 days—at the end of which time they were forced to rely upon whatever nature had to offer—which wasn't a great deal under the circumstances.

Further handicaps were the lack of a rifle, and proper fishing equipment. The only line they had proved useless in this lake which had water to a depth of 60 feet.

After several days of mere existence on berries, most of which were barely palatable, they managed to snare a small ground squirrel. This was put into the pot and boiled and stewed alternately (according to their story) until they were sure the soup would, at least, have a squirrel flavor. The remains of the little animal were then set aside to provide a second meal—if meals they might be called.

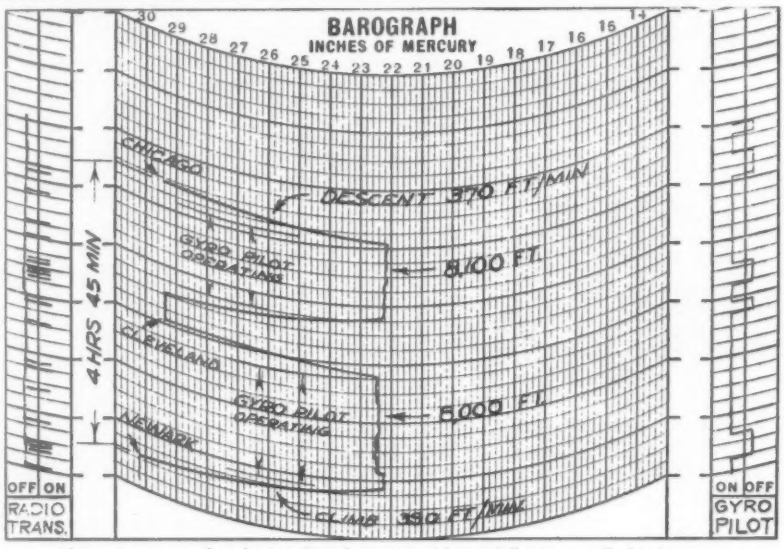
Just when the berry season was nearing its end, they managed to snare another squirrel. This time he was a "beauty" to use their expression, and provided them with nourishment for several days.

The flyers were now beginning to feel the loss of strength. The three-mile walk for wood was becoming a real effort. It was, however, very necessary to keep a fire, not only for warmth, but as a beacon to those whom they knew would be looking for them, and also to hold any lurking wolves at bay. Yes, they had watched the fiery eyes of these beasts in the darkness beyond the fire and knew, too well, what they were waiting for. Fortunately for these men, the caribou were fairly plentiful and provided sufficient food for wolves, else these wily creatures might not have been so easily held off.

One day when Coleman was returning with a supply of wood he saw a lame caribou. Throwing down his load he took after it, but, as it still had three good

(*Concluded on page 90*)

United Air Lines' Flight Recorder



Above is a sample chart taken from an airliner following a flight between Newark, N. J., and Chicago. The entire flight procedure is automatically recorded.

MUCH attention has been drawn to the automatic flight recorder as a result of the recent crash of an airliner in the mountains of Utah. This tragedy differed from other airline mishaps in that, for the first time in airline history, a definite record of what took place immediately before the fatal crash was found in the wreckage. A chart exactly like that shown above told investigators more than they had ever been able to ascertain in the past.

When understood, the above chart is easily read. The takeoff took place at the bottom of the chart and the angular line running from the takeoff can be measured to ascertain the airliner's rate of climb. Incidentally, the chart's horizontal lines separate 15-minute periods. In the far left-hand column it can be seen that the pilot made several radio contacts with the ground. Each time he presses his radio switch, a needle records in the "on" column. It can be seen that the ship climbed to 8,000 feet where the gyro-pilot was switched on, leaving pilot and co-pilot to perform other duties. The landing in Cleveland is easily recognized. It also can be seen that the ship was on the ground at Cleveland for about 25 minutes. Taking off again, the ship was climbed to 8,100 feet where the gyro-pilot again was used. The landing at Chicago was normal. The wavy line at 8,000 feet is bumpy air.

New Lightweight Air Radio

IN A SINGLE, small and light-weight radio receiver for aircraft, Bell Telephone laboratories have combined three important services for the private flyer.

Now, in the limited space available aboard the smaller types of planes, this compact unit may be conveniently installed, bringing to the pilot efficient reception in the beacon and the broadcast bands as well as in the short-wave bands employed for communication with ground stations.

This three-purpose receiver is known as the Western Electric 20 type, and is supplied with or without a small remote control unit, which may be mounted on or near the plane's instrument panel. A flexible cable connecting the remote control unit with the receiver, permits installation of the latter in some out-of-the-way corner of the plane.

The new receiver is a superheterodyne, with one stage of tuned radio-frequency amplification, two stages of intermediate-frequency amplification and two stages of audio-frequency amplification. Four separate frequency bands are provided, the first band being 200 to 400 kilocycles, for beacon and weather stations. The second band is from 550 to 1,500 kilocycles, for commercial broadcast stations. The third band is from 1,500 to 4,000 kilocycles for aircraft, police and amateur communications, and the fourth band is from 4,000 to 10,000 kilocycles, for aircraft and amateur communications and for foreign broadcast stations.

One form of the receiver has its controls mounted directly on the front panel and is intended for mounting within easy reach of the pilot, whereas the other is provided with a remote control unit on a flexible cable. The diminutive control unit may be mounted flush on the plane's instrument panel, if desired, for convenience and accessibility.

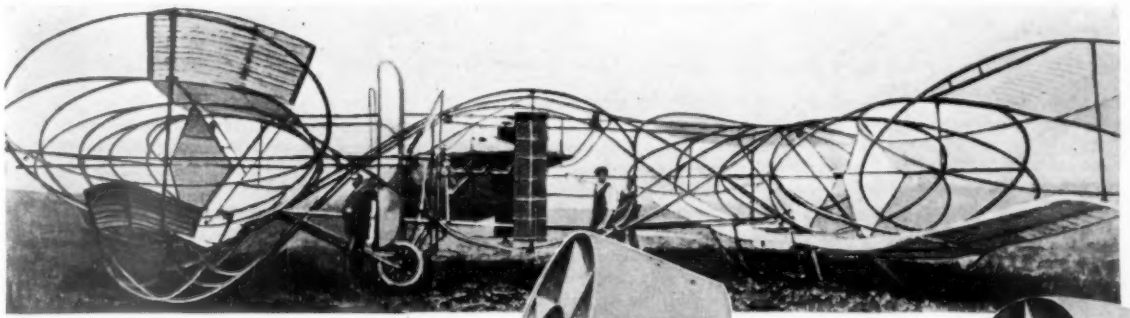
(*Concluded on page 74*)

CRAZY PLANES

A gentleman named Tilgham Richards Annular was responsible for the weird-looking crate below. It was a failure.

Englishmen of 1910 "had something there" when they dubbed Seddon's ship (below) a monster.

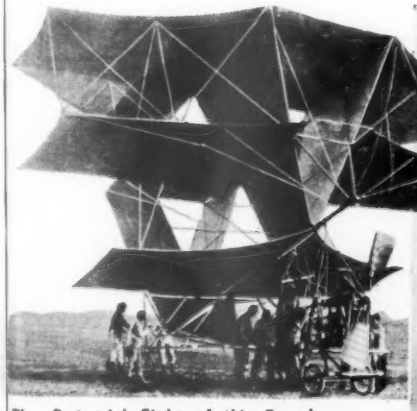
This ship was comparatively a huge success. Built in 1912 by a German, it flew, but not long.



IN few other fields do inventors have the opportunity to "run wild" as they have in aviation. The photographs on this page are proof of that, even though many of them "gave their all" in the early part of the century. Far from being a true ratio between successes and failures among airplane inventors, one out of the six gadgets on this page actually flew.

Knowing what we know about aviation and airplanes today, it requires a tremendous stretching of the imagination to "see the point" in connection with some of the sky-rangers on this page. But the men responsible for these crazy planes unquestionably were as sincere as our Wright brothers. But our boys made it.

M. Givaudan, an imaginative Frenchman, was a little too optimistic in expecting the above contraption to fly. This effort was in 1900. Seven years later (below) another Frenchman tried. Result: the same.



The first trial flight of this French design ended in a complete washout.

It is known that a large number of Vultees (above) have been shipped to **RUSSIA**

EXTRA

PLANE SALES SOAR WITH WAR THREATS

Foreign Nations Scramble to Buy American Aircraft

Yank Factories Swamped

by MORTON B. KELMAN

IN the past few years the exporting of aircraft, aircraft engines, parts and accessories has risen to tremendous heights. The United States now leads the world in the exportation of aeronautical equipment, having wrested this distinction from several European powers.

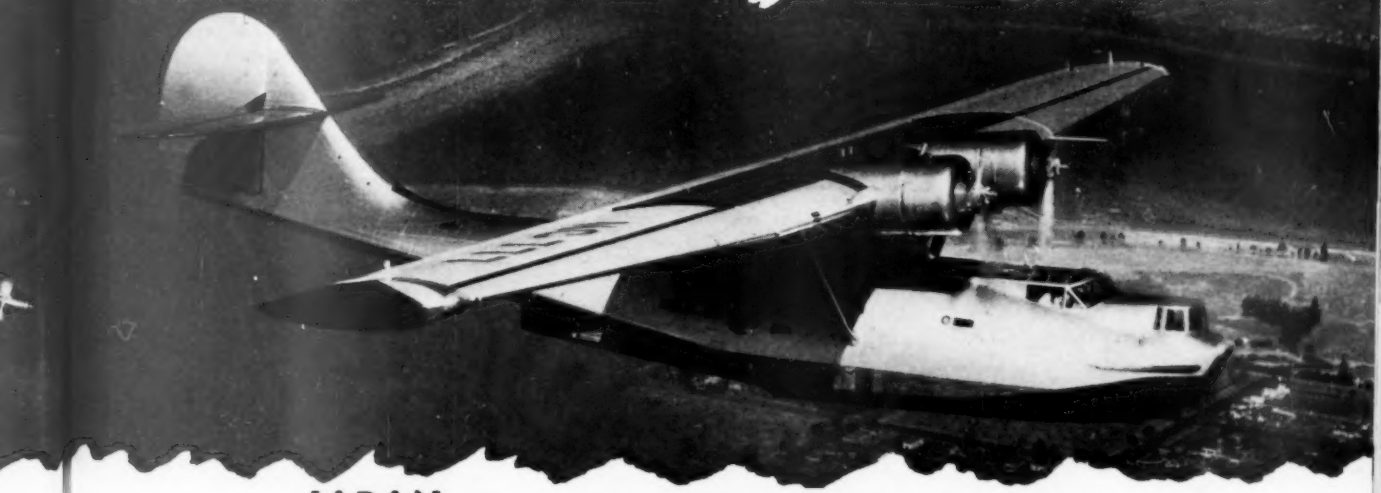
Manufacturers of aircraft materials in this country have finally obtained the interest of purchasers abroad. Such interest has not been displayed in the past due to restrictions placed upon the exporting of materials pertaining to aviation from the United States. Many foreign countries would have jumped at the opportunity of securing American-manufactured aircraft and aircraft equipment years ago—if such material could have been procured. Now that these exporting barriers have been removed through the efforts of the State and Commerce Departments, who regulate our aeronautical affairs, the business backlogs of many American aircraft manufacturing firms contain foreign orders.

The demand for aeronautical equipment that is manufactured in the United States is accounted to the specific type of accoutrement that is available in this country. Special types of aircraft and other aeronautical supplies have been developed in the U. S. to meet the requirements of our airline companies and private flyers which is contrary to the foreign notion that such materials are perfected solely for military use. This militaristic attitude forces the foreign buyer to seek elsewhere for commercial flying equipment and discovers that the U. S. is a source of supply for his needed materials.

The U. S. Department of Commerce controls the exporting of commercial aircraft and all other materials associated with commercial aviation. This depart-

These twin-engined custom-built Bellanca bombers were contracted for by **COLOMBIA**

WARPLANE SALESMAN

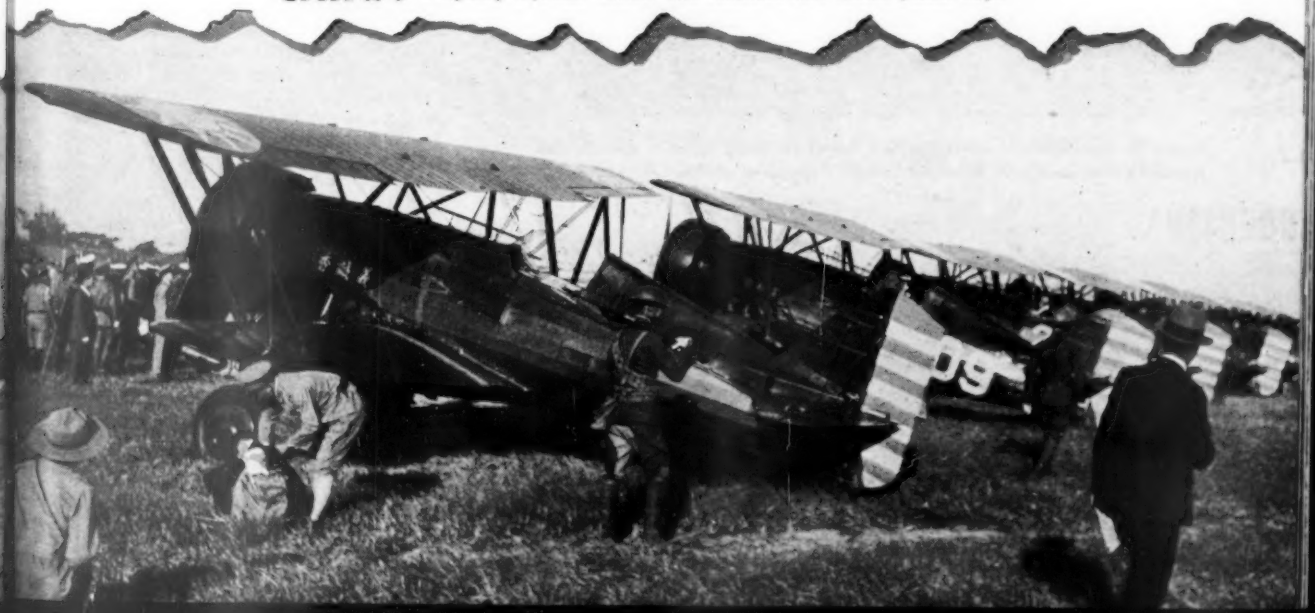


JAPAN became an American customer recently by buying some Consolidated PBY-1's.

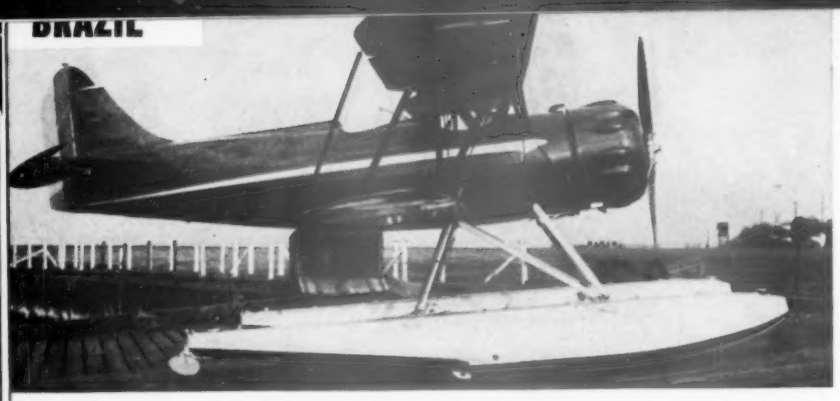
ment has arranged international airworthiness agreements between the United States and Belgium, Canada, Denmark, Germany, Great Britain, Australia, Italy, Norway, Sweden and the Union of South Africa. These airworthiness agreements include reciprocal and unilateral agreements, the former being an arrangement between two countries whereby each party agrees to recognize the airworthiness of aircraft certified by the other party under certain specified conditions; the latter is one side of a reciprocal agreement as it is a statement of terms under which the Commonwealth of Australia, Canada and Great Britain will validate United States Certificates of Airworthiness. These three countries each require certain additional features for the inspection of aircraft not provided for in our regulations. Certificates of airworthiness for export constitute certification by the United States government that the specific aircraft or aircraft part has been examined by the Department of Commerce and found to conform with the airworthiness requirements of the particular case. The certificates are issued, upon application only, at Washington, D. C., and are essential because it would be virtually impossible for a foreign purchaser to obtain a license in his own country for an American airplane unless he presented a certificate of approval that was issued by the Department of Commerce.

Certificates of airworthiness are issued for the exporting of aircraft and their parts, which are divided into three general classes as follows: Class One Units, defined as any complete aircraft or aircraft units having type approvals in themselves or in major assemblies of aircraft structural parts; Class Two Units, defined as any assemblies or parts which directly influence the airworthiness of an aircraft except for small standard parts that are under Class Three listing. When a manufacturer wishes to export material listed under the Class One category he submits a standard application to the supervising inspector of the Bureau of Air Commerce of the Department of Commerce in his district who will arrange for the necessary inspection and reports. The procedure taken in the issuance of Class Two Unit certificates is as follows: The manufacturer requests an inspection of the parts he wishes to export. The Bureau inspector in the district attaches inspection tags to the parts upon being satisfied that the parts are airworthy after which the parts may be shipped without further reference to the Commerce Department. Small units that are described as belonging to the Class Three category may be shipped without reference to the Department of Commerce. In these lat-

CHINA is fighting Japanese aircraft with American-built Curtiss pursuit ships.



BRAZIL



Brazil is one of Uncle Sam's best airplane customers. The new Waco seaplane above now is serving as a combination mail and patrol plane. It carries guns.

ENGLAND

Though the British hate to admit it, they admire—and buy—many an American airplane. This Fairchild is used by the British for important fast liaison work.

MEXICO

Several Spartan fighter-bombers (the first above) are being rushed to Mexico. The Argentine army uses many American Voughts (below) which they call "Corsarios."

RGENTINA

ter cases the manufacturer's invoices serve as evidence to the foreign government officials that the parts were manufactured in accordance with the approved specifications of a particular aircraft or component.

When aircraft destined for export are flown to a seaport or to the border, the exporter obtains foreign registration markings from the importing country and affixes them to the aircraft for use on such ferry flights. Very often special ferry numbers, preceded by the letter "F", appear on planes intended for export. The number is a particular district number issued expressly for the ferry flight by the Department of Commerce. Special authorization for each such flight is issued by the Commerce Department except that when the aircraft is purchased by a foreign government for conversion to military use the exporter must apply to the Department of State for permission to fly in the United States with foreign markings.

The State Department controls the exportation of aircraft bearing military equipment. This department has established laws and regulations, that are administered by the Secretary of State, governing the international traffic in arms of which the exporting of military aircraft is listed under Section 5 of the Joint Resolution of Congress, approved May 1, 1937, which provides for the prohibition of the export of implements of war to belligerent countries who have declared a state of war.

Export licenses are required for each individual shipment of military aircraft material to non-belligerent countries. These licenses are issued by the Secretary of State to all applicants who have duly filled out applications for licenses. The export licenses are not transferable and are subject to revocation without notice if the exportation authorized by the license becomes illegal before the shipment is made. The exportation of military aircraft is subject to the same regulations and inspection which govern the export of all types of aircraft.

Many types of military aircraft that are manufactured in the United States are built solely for export purposes. This particular type of aircraft is constructed expressly for the importer, according to his specifications, and is not in service in any of Uncle Sam's armed forces. On the other hand, there are planes that are exported that are almost exact counterparts of planes in our military air forces. These planes may differ in the respect that the equipment installed in them is not used by our air corps according to the facilities the importing state possesses to easily replace these particular articles or due to the essentiality of such equipment. For instance, a country may order several planes for their air force powered by X engines. The facsimiles of these planes that are in our air forces may be installed with Y engines. The importer knows that X engine parts are easier to secure than Y engine parts due to the fact that Company X has a factory situated nearby that can supply him with these parts and so orders X engines to

power his aircraft. Another reason for the slight modifications these planes may have may be accounted to the atmospheric conditions in which these planes may have to operate. Aircraft may be imported by countries with mountainous terrain which forces the planes to fly in high altitudes necessitating the use of special high altitude equipment, or by countries who have large bodies of water over which the planes are forced to fly thus making necessary the use of floats. There are also various other motives for the changes that appear on export craft owing to the whims of the importer.

Many air forces the world over have been supplied with aircraft of American manufacture and if ever adequately equipped would rival the thrusting power our air services possess because these countries have been outfitted with the most modern of fighting equipment, duplications of which can be found in our air forces.

One of the largest suppliers of military aircraft to foreign countries, as well as to the United States government, is the Consolidated Aircraft Corporation, manufacturers of various types of aircraft ranging from small primary trainers to huge naval flying boats. Incidentally, Consolidated makes more export sales on these extremities of their production range than on the other types of aircraft the company offers for export. Consolidated training planes have been exported to the Argentine (where 21 are in use), to Brazil (where one is utilized), to Canada (where several are in service patroling the gold fields), to China (83), Colombia (18), Mexico (6), Paraguay (1), Peru (1), Portugal (10), Roumania (22), Siam (4), Spain (1) and Turkey (12). As Consolidated has been the main source of supply for naval patrol boats to the U. S. Navy for many years, other powers desiring patrol boat equipment have placed orders with Consolidated for these flying boats, granting that if these boats are competent enough for our Navy, they should be equally as efficient in their own naval service. Consolidated has exported several of its *Ranger* type patrol boats to South American republics in addition to sending 14 of its latest patrol boats to Argentina. These new flying boats are counterparts of our naval PBY-1 patrol-bombers that feature two twin-row engines rated at 1,000 h.p. each, and a semi-cantilever wing with bomb racks and retractile wing-tip floats installed. Two PB's have also been shipped to Japan and another one will be ready for delivery soon. The U.S.S.R., who has already obtained the rights to manufacture this patrol-bomber, borrowed a commercially-licensed patrol-bomber to search for the lost polar flyer, Sigismund Levanevsky, and his companions. Fleet Aircraft Ltd. of Canada, formerly a subsidiary of Consolidated, has secured the rights to manufacture and sell all designs of Consolidated aircraft that are released by the United States government.

The Curtiss-Wright Corporation is also a major exporter of military aircraft. This company presents a new aspect to military aircraft exporting by develop-

The Netherlands and Turkey proved to be our best customers for Martin bombers. The latter, in fact, has a factory equipped and licensed to build these ships.

BRAZIL

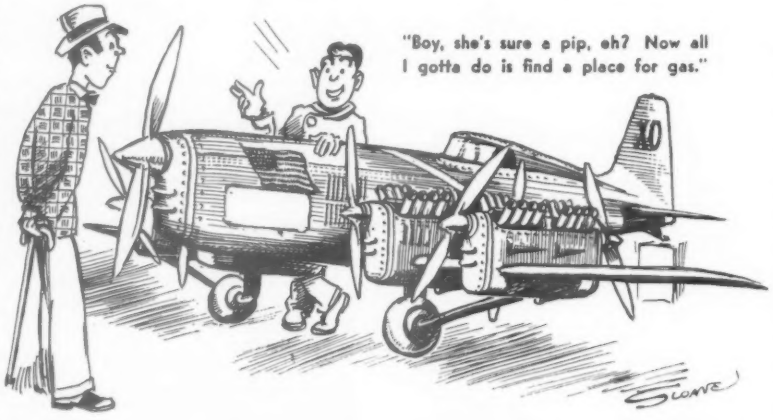
The Brazilian army has purchased a fleet of American Stearman scout-fighters like that shown above. Brazil also buys Curtiss, Vought, Boeing and Bellanca.

CANADA

Though Canada buys American trainers like the above Fleet, she is a better customer for civil aircraft. The Vought fighter below awaits a purchaser.

WHO?

ing special types of aircraft for foreign powers besides supplying importing countries with other types of aircraft that are facsimiles of craft in our air services. Curtiss has developed a special type of observation plane for the Colombian government, *Condor* BT-32 bombers for China and Colombia, *Osprey* trainers and light attacks for Ecuador and Brazil, a Type II *Falcon* and Type IV *Hawk* for any countries that wish them, and a light attack basic trainer, the 19-R, for the Ecuadorean Military School of Aviation. Other types of Curtiss trainers and attacks have been exported including a number of *Shrike* attacks to China. A fleet of Curtiss Type II *Hawks* have also been shipped to China. Cuba possesses a number of Type II *Hawks* as does Turkey who received a contingent of 24. The Type II *Hawk* is the forerunner of the Type III *Hawk* of which ten have been freighted to China, ten to the Argentine Naval Air Service, and several to Siam. The newly developed *Hawk 75* has been released for export and orders for the ship have been received from the Argentine and China. The *Hawk 75* is similar to our Air Corps P-36 pursuit ship differentiating only in the rigid landing gear the 75 is equipped with. Curtiss-Wright has assisted in the development of factory operations at the Turkish Airplane Factory in Kayserie and also in Hangchow and Shiukan, China.



Chance Vought has also been on the receiving end of several foreign orders for their new *Corsairs*. A series of the Vought V-142 has been shipped to the Argentine, where they are known as *Cosarios*, and to other countries. The new low-wing single-seater V-143 is also available for export having been manufactured expressly for the export market. Other types of Voughts have been exported to Brazil, China, Cuba, Mexico, Siam, Japan, Peru and Great Britain where several were delivered the Royal Air Force for experimental purposes.

The Stearman Aircraft Company is also a major exporting firm, engaged in the shipping of various types of training planes to a number of countries. Stearman has supplied the Philippine Army Air Corps with a fleet of seven 73L3 primary trainers and three 76D1 advanced trainers and expeditionary planes. Ten of the 76D1 type, some mounted on Edo floats, were also delivered to the Ministry of Marine at Buenos Aires for the Argentine Naval Air Service. The Brazilian Army Aviation Department will soon be the possessor of 30 Model 76C3 advanced training planes.

The Vultee Aircraft Division of the Aviation Manufacturing Corporation has also gone in for some tall exporting of military craft. Secret numbers of their V-11G attack-bombers have left these shores for foreign ports. Several V-11 G's are known to have been sent to the U.S.S.R. via New York. About the only large shipment of these planes from this country that was not hushed up was the shipment of 70 of these versatile craft to China.

Glenn L. Martin, famous as a supplier of bombing craft to the U. S. Army Air Corps, has found new purchasers in China, Siam, Turkey, Argentina, the Dutch East Indies and the U.S.S.R. for his Model 139-W light bomber. The Martin 139-W is the export version of the B-10B bomber our Air Corps is equipped with. The Soviet Republic has secured the rights to build the 139-W. Martin is now building a huge four-engined flying boat, a larger and revamped edition of the Model 130 "Clipper" series, for Russia.

Seversky Aircraft has recently exported its new "convoy fighter" to South America, where it will embark on an aerial demonstration tour of all of the principal cities of the continent, before proceeding to Mexico City and home. The "CF" can be fitted with engines ranging from 400 h.p. to 1,200 h.p. and interchangeable wings of varying lengths. These changes are made when it becomes necessary to convert the plane into a different type of aircraft. In the demonstration flights to Brazil, where the pending order calls for 30 pursuit planes and 50 advanced trainers of Seversky manufacture, the demonstration for both orders will be made with the same airplane. The Japanese government placed an order for three of these convoy fighters before hostilities commenced. The Chinese government also seems interested in the "CF" having sent a representative over to test one of these ships. Seversky has already exported three SEV-3M-WW amphibian-fighters to Colombia and has two others of the same type under construction for the U.S.S.R., who has procured the manufacturing rights for this plane.

The Boeing Aircraft Company has not been active in the export field of late, being busy constructing bombers for the Air Corps, but some time ago shipped ten Model 281 fighters, similar to the Army P-26A pursuit planes, to China for the Cantonese Air Force. One 281 was also sent to Spain. A Japanese firm, manufacturing a type known as the AN-1, supplies the Nipponese air force with planes very similar to the Boeing 281. The AN-1 has the same general appearance as the 281 differentiating only in the cockpit enclosure, fairing and empennage. It is not an established fact that this company ever purchased the manufacturing rights to this airplane.

Grumman Aircraft has recently entered the export business by shipping eight single-engined general-utility amphibian planes to the Argentine. These amphibians are similar to the JF-2 planes that the United States Marines and the Coast Guard are equipped with. Grumman has released design rights for the building of its two-seater fighter, similar to the U. S. Navy FF-1 fighters, to the Canadian Car and Foundry Company of Montreal. Other types of Grumman planes that are available for export are their two-seater scout and single-seater fighter. The scout is a counterpart of our Navy SF-1 and the fighter is a facsimile of the Navy F2F-1.

Spartan Aircraft has just finished constructing their first military airplane and has placed it on the export market. This ship is known as the *Zeus* 8W and is a two-place high performance general purpose airplane powered by a 550 h.p. Wasp S3H-1 engine. A *Zeus* 9W is also available for export. This type can be used as a basic combat plane being of all-metal construction, the same as the 8W is, and is powered with a Wasp Jr. SB rated at 400 h.p., unlike its predecessor.

The Northrop Corporation has lately outfitted the Argentine Army Air Service with 35 Model 8 attack planes. These ships are export versions of the U. S. Army Air Corps A-17 attacks. Other types of Northrop attack planes have been purchased by China and Great Britain. The Canadian Vickers Company, having obtained the rights to build the Northrop *Delta*, has constructed three planes of this type for the Royal Canadian Air Force for operation on floats.

North American Aviation has received orders for a number of NA-16 general purpose planes from Argentina, Australia and Sweden, who has procured the rights to manufacture this ship.

Waco Aircraft has shipped 29 Model CPF planes to South America for the Brazilian Military Air Mail Service, a WHD military trainer and light attack

(*Concluded on Page* 88)

Battle OF LIGHTPLANES

by FRANK NOBLE

Here's a highly imaginative aviation yarn for you lightplane fans. Hurry! Pick your winner!

Screaming up into a steep wingover, a Cub fighter attacks an unsuspecting enemy Cub scout. With a terrific clatter a bean-shooter swings into action and the scouting lightplane dips a wing, shudders slightly, then falls off into a jerking spin. Hurriedly, the vanquished airman bails out. (Ho hum . . .)

THE grey dawn was just breaking as a fleet of six Taylor *Cubs* took off their home drome at Lock Haven, Pa., armed with the last word in 10 gauge shotguns.

At Alliance, Ohio, four Taylorcrafts lifted their wheels from their port and headed east, with two .22 cal. machine guns jutting out of each nose, and looking for trouble.

Over the Pennsylvania-Ohio boundary the two fleets met and a free-for-all ensued. The sky throbbed as the Continental A-40's pounded out their egg-beating tune, accompanied by the wail of blasting shotguns and the shrill tune of machine guns.

The Taylorcrafts liked the head-on approach because of the *Cub* blind spot, and two silver *Cubs* went down before the remaining four ganged a Taylorcraft, blasting the tail assembly to shreds, forcing the pilot and gunner to take to the silk. With gas tanks running low, the fleets separated and proceeded to their home ports for service and repair.

At Kansas City, Mo., three Porterfields took off with five-pound bombs, consisting of Limburger, Sweitzer and T. N. T. They were going to bomb a menace of the lightplane field—the *Knight Twister* plant at Cicero, Ill. But, having undercover men at the rival's plant, Payne had three of his vest-pocket pursuit jobs waiting on the bombers. With a scream of wires and a roar from the Ford motor in their nose, the *Knight Twisters* dived on the Porterfields. Dropping their bombs in a hurry, the latter turned their 410 ga. shotguns on the attackers.

At this minute a fleet of Rose *Parakeets* and Aeronca "K's" dropped in with a wild dive. On the way down one Rose threw a wing as a Continental dropped a shaft and threw a cylinder through the center section struts.

From the east came *Cubs* and Taylorcrafts, and out of the west came two flights of Arrow *Sports*. Then, coming out of the sun in a 9g dove a squadron of Luscombe 50's.

The flight was now on in earnest. A *Knight Twister* which had been climbing now started downward in a plunge that ended under the belly of an Arrow *Sport* whose pilot was blind in that spot, and poured deadly 22 cal. slugs into the fabric covered fuselage, until the Arrow went into a power spin to its destruction.

A Luscombe settled itself on a *Parakeet's* tail and the Rose could not dislodge

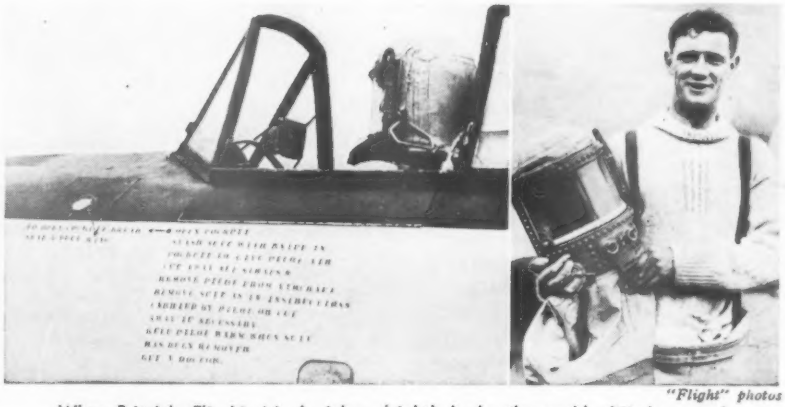
(*Concluded on Page* 94)

Personalities

Few persons know that the famed body-loving Bernarr Macfadden flies his own Stinson "Reliant" on long trips.

If not the whole aviation industry's best friend in the White House, Mrs. Franklin Delano Roosevelt is at least the airlines'. A consistent air traveler, Mrs. Roosevelt was snapped (above) at Minneapolis' air terminal.

Paul Mantz, Hollywood's top-ranking honeymoon pilot and adviser to the late Amelia Earhart, is in the movies.



"Flight" photos

When Britain's Flt. Lt. M. J. Adam (right) broke the world altitude record recently, his ship carried grim directions (left) for removing the pilot in case of an accident. Adam's special oxygen suit, however, functioned perfectly.

Above is a recent bull-session of famed military air names and nicknames. Left to right are Majs. O. G. "Non-stop" Kelly, A. W. "Topmost" Stevens, Col. F. L. "Shipwreck" Martin and Lieut.-Comm. "Sailplane" Connell.

Meet C. S. "Casey" Jones who, if some folks have their way, will replace Fred Fagg as Air Commerce Director.

Captains (Coast Guard) J. T. Daniels (left) and A. D. Etheridge (right) saw the Wright brothers make that famous Kitty Hawk flight. Daniels was later hurt in a Wright crash. They recently took their first flight since 1903.

United Air Lines was wise in (1) hiring Maj. R. W. Schroeder and (2) in recently electing him vice-president.

Countess Daisy di Carpenetto, Italian newspaperwoman, arrived in the U. S. recently to study air transportation.

Walter Craig of Selma, Ala., hooked a Brownie to his glider's wing, snapped the above picture with his right hand.

Actor Robert Cummings flies his small ship between Hollywood and whatever movie set he happens to be working on.

Air racing may have had its points in days gone by but racer Roger Don Rae prefers his job as a TWA first pilot.

Harold Neumann flew many a hair-raising race against Rae. Now he, like the former, prefers his airline job.

Another ex-racer-turned-airline-pilot is Robert Buck. He broke (and still holds) several junior marks.

Our Front Cover: the Waco "N"

THE story behind this month's front cover is particularly interesting inasmuch as it is POPULAR AVIATION'S second effort toward the perfection of Kodachrome photographs for use on this cover. Last month's issue carried our first attempt to reproduce the tiny Kodachrome film.

It is fitting that we should try a new cover with a new airplane. The Waco "N" is particularly suited to this purpose. This airplane marks the acceptance by one of of the country's largest manufacturers of the "tricycle" landing gear which is staging a thorough comeback. Actually, Waco has been experimenting with its Model "N" for the past three years. The ship shown on this page and the front cover is the first production model to be shown publicly. Though the "N" looks like the standard Waco cabin ships, it is nonetheless a completely new job of engineering from the ground up.

Much the same basic performance is achieved with the "N" as with such other new tricycle aircraft as the Gwinn, Stearman-Hammond and Waterman. It is impossible to nose over or ground-loop. Consequently, the hitherto dangerous cross-wind landing or takeoff can be made with ease. An automatic flap system is installed which, when in operation, will not permit the "N" to fly faster than 90 m.p.h. even in a dive. When the throttle is opened, however, the flaps retract automatically. The closest to retaining the features of the conventional airplane but still including many of the advantages of the newer craft, the "N" is being considered as a "tricycle trainer" by certain American airlines. The airplane could be used to familiarize airline pilots with the unusual landing technique in preparation for the delivery of the new Douglas DC-4, which will also have the three-wheeled landing gear . . .

Actual Size of 35 mm. Negative.

So far as POPULAR AVIATION is concerned, the printing of this month's front cover is little more than an experiment. Last month's cover showing the Boeing *Flying Fortress* was our first departure from hand-painted covers in many years. The experiment is not only in our use of the picture itself, but in the particular type of processing used by our engravers in Kodachrome work. The story behind this month's front cover is, therefore, worthy of description:

The color photograph of the Waco "N" was made recently at the National Air Races by N. R. Strohmeyer, POPULAR AVIATION staff photographer. Mr. Strohmeyer used standard 35 mm. Kodachrome miniature-camera film. The camera was a standard Leica.

To give you some idea as to the comparative sizes of the original negative and the finished cover, we include the small photograph at the top of this page. This picture is the actual size of one 35 mm. frame. From a negative this size, the front cover was enlarged—an enlargement of over *11 times* the size of the original picture.

The actual plate production is known as the four-color process. That is, four colors (red, yellow, blue, black) must be blended on the press to make the cover.

Here is an interesting view of the new Waco "N". According to company officials, deliveries on this model are slated to start late this month.

Parachute Tales

OVERSEAS, a young American-Italian lad bailed out right into a mess of trouble. On September 16, Vincent Patriarca, was flying a fast Italian plane, engaged in battle with Spanish loyalist planes. Pietro Utarbi, a Loyalist who had been doing splendid flying for his government, deliberately collided with Patriarca. Vincent bailed out into the arms of the loyalist forces. Brave Utarbi, caught in his antiquated plane by a broken wing, was unable to jump and was killed.

* * *

GOING up on a routine daily weather observation flight, Captain W. O'Connor of Patterson Field relaxed. Suddenly his motor failed, and on that day, October 27, O'Connor was initiated into the Caterpillars.

It seems he relaxed a bit too much for, before he could get the ship's suddenly-heavy nose down, she was out of control.

* * *

SOMEHOW it's the innocent bystander who gets it in the neck. In this case it was a family of ten who were the victims. The Seltman family, a couple and eight children were asleep at 4:40 in the morning of last January 2 Over the town, Bellmore, L. I., an Army plane flown by Lieut. Moorman of Mitchel Field, was testing instruments for weather recording. Suddenly he noticed flames shooting out of the instrument board.

He headed the plane for the sea, and bailed out. He landed safely at Merrick, L. I. The pilotless plane in the meanwhile had changed its course.

With a crash the plane hit the corner of the second story house in which the Seltman family slept. The impact threw the children out of bed and three were slightly injured. Luckily the plane didn't burst into flames, the impact putting out the small fire in the plane.

* * *

THE beautiful Apennine Mountains in Italy was the site of two men saving their lives in 'chutes. Five were flying in an Italian bombing plane on June 4, over the mountains. The plane went out of control, and two were saved by their 'chutes.

* * *

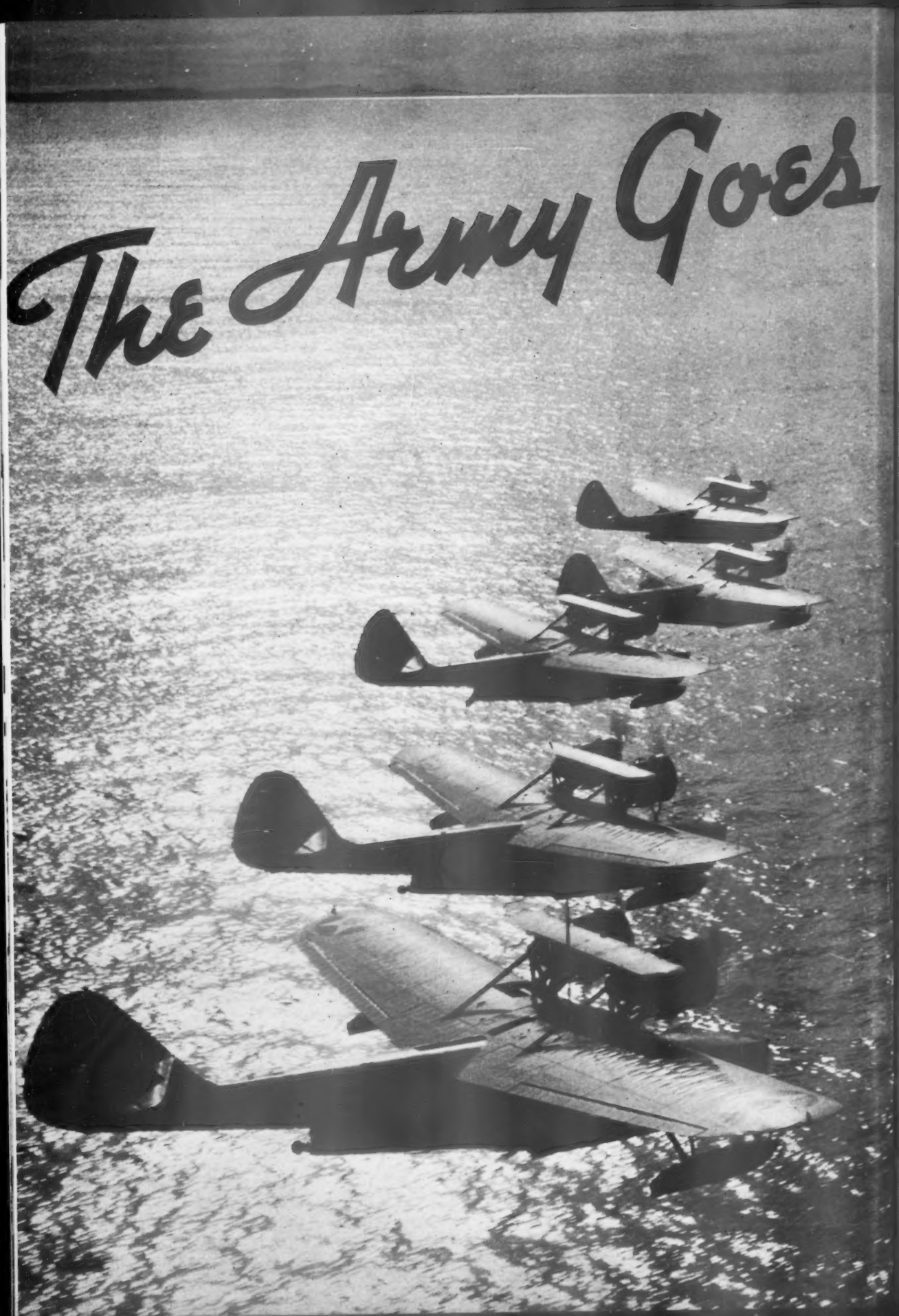
ON AUGUST 21, the Army was conducting a series of sham battles in the East, which was reviewed with much interest. A plane from the 97th Observation Squadron was flying around when the gas line clogged. The observer, Private White, leaped for his life and was saved.

When the plane was found nosed in, the body of its pilot was nearby with his 'chute unopened. For some unknown reason the rip cord wasn't pulled by Lieut. Scherer.

(*Concluded on page* 90)

NEW WINGS FOR 1938

EACH new year is sure to bring forth a host of new and interesting developments in the airplane field. In much the same manner as the new-car fan, the new-plane fan looks eagerly for the new models. The three ships on this page start off POPULAR AVIATION'S new-plane show for 1938. Shown from top to bottom are the Brown-Young BY-1, the Spartan *Zeus* and Beechcraft's amphibian. The Brown-Young (yet to be licensed) will go on the market with a 225 h.p. Jacobs. The Spartan is part of a military order for Mexico.


The Army Goes

To Sea

by
ROBERT McLARREN

It's a little hard to believe, this business of flying sailors in the Army Air Corps. But take it or leave it, the landsmen like the water.

THE United States Army Air Corps' winged soldiers are going to sea!

This was the announcement made recently by Lieutenant-Colonel Howard Davidson, commanding officer of the Nineteenth Bombardment Group of the GHQ Air Force station at March Field, Riverside, California. The Air Corps' high command has been greatly pleased with recent long-distance, over-water flights made by a group of Army birdmen under the command of Major Albert F. Hegenberger, who with Lieut. Lester Maitland, (now Major and Commander of Barksdale Field, Louisiana) completed the first successful flight from Oakland to Honolulu. Two outstanding flights have been completed; one from March Field down the coast of Mexico to Panama, the other, an extended over-water, nonstop, record-breaking hop from Coco Solo to Langley Field, Virginia.

With such promising results from these flights, longer and more gruelling tests of the huge Douglas amphibian will be conducted in the immediate future. Brigadier-General Henry B. Claggett, commander of the first wing, GHQ Air Force, has assigned the task of pioneering the flying of the Pacific frontier to the Nineteenth Bombardment group.

Two salient questions in the mind of the public are: "Why is the Army conducting such tests?" and "What is the purpose of these flights over water when the natural medium of soldiers is the land?".

In an interview with Lieutenant-Colonel Davidson, conductor of the tests, he gave the following opinions:

"To answer your first question, we are flying these navigational missions over the Pacific because that ocean is one of the future battlegrounds of a possible 'next war' and the direction from which attack is most likely to come. In reply to your second query, I am of the opinion that, although the principal mission of Army Air Corps aviation is the protection of the land, it must also be prepared to engage the 'enemy' at points several hundred miles out at sea."

With immediate prospects of long-range, non-stop flights to Alaska, Panama, and perhaps a flight over Hegenberger's old route to Hawaii, the gargantuan Douglas monoplane is being groomed and held in readiness.

The ship, known technically as the YOA-5 (Observation-Amphibian, Model Five) was designed and built for the Air Corps with these long-range flights in mind. Such a plane had to combine a tremendous load carrying ability with low fuel consumption, crew comfort, heavy armament, and be of the amphibian type with the ability to take rough water landings in mid-ocean without strain. That this ship has met all of these requirements can well be ascertained by the high praise of Air Corps officials. It is powered by two Wright *Cyclone* engines, model SIGR-1820-14 of 750 h.p. each.

The ship, fully loaded with its 1,150 gallons of gas, weighs over 30,000 pounds. With a full crew of eight men, the YOA-5 has a top speed of 190 m.p.h., exceptional for a huge, sea-going army patrol plane!

Its 95 feet of wing span supports the two engines in streamlined nacelles high above the fuselage, away from the ocean spray of take-offs and landings. Two pontoons, almost the size of small row boats, are slung under each wing panel A retractable tail wheel swings up and out of the way for water landings. The interior is equipped with a vertible maze of radio, navigation, control, and retracting mechanism, not to mention several rubber life rafts, an outboard motor, emergency rations and sleeping equipment for the crew.

This YOA-5 boasts of more than just its flying ability for in its nose is a completely enclosed gunner's turret while aft on its turtleback are watertight implacements for two gunners.

Should the outcome of these gruelling tests be successful, the Air Corps will order a large number of these "flying dreadnaughts" which, with the Navy's fleet of huge patrol boats, will give Uncle Sam a formidable coastal air patrol defense against his only fear: an enemy attack from the air.

The announcement of the Air Corps' new policy will excite little change in the Service. The Army birdmen will not feel strange in their transplantation

The Army Air Corps went to sea for the first time many years ago. The photographs here are historical proof of that. Remember the famous flight of Hegenberger and Maitland (left) to Hawaii? And far more widespread but somewhat less successful was the triumphant round-the-world flight of the Army in 1924. These pilots are shown below.

Pointing its sharp nose toward the United States, the Army's Douglas OA-5 leaves the Canal Zone on one of its many overseas flights. Army officers are experimenting extensively with this type airplane for long water hops.

to a new habitat for the operation of amphibian and seaplane types of military aircraft is strictly a matter of routine. Twenty-two Douglas *Dolphin* twin-engine monoplanes are now rounding out a five-year period of service during which they have earned an enviable reputation. These amphibians were originally purchased for service in Uncle Sam's mid-Pacific possessions. A new tactical mission was evolved for them in the course of construction and they were placed into service at home as emergency equipment.

In this work they proved of invaluable aid serving as aerial missionaries of mercy during time of flood and the subsequent days of peril and human suffering. These planes have proven virtually limitless in flexibility of operation and their amphibious design has been responsible for the saving of many human lives. They were particularly in evidence during the recent Ohio River Valley disaster as well as the horrific holocaust of three years previous.

During service operation however, they have done duty as cargo, photography, and personnel transports. Upon the recent decision of the Air Corps' High Command, these planes were all transferred to Langley Field to serve as training ships for our new Army Air Corps sailors.

Other planes now being used in this training capacity are the Fairchild C-8 and the Martin B-12 seaplanes. These two types, while distinctly individualistic in purpose, have both proven themselves valuable testing mediums. The former is a photography ship and much important experience has been gained in over-water completion of photography missions. The famous Martin bomber is, of course, more sinister in scope and the possibilities of our Air Corps' successful engagement in over-water bombing operations have been considerably increased. Admirable performances have been chalked up to this hybrid craft and much valuable data has poured into Air Corps files.

With the disclosure of the results of recent tests, the Air Corps has stated that it can convert a full squadron of Martin bombers in seaplanes in 24 hours!

This now places our Air Corps bombing squadrons in the valuable position of instantly available reserves for U. S. Naval aviation. Should a section of our Navy's air force be destroyed or seriously impaired at a strategic point on our coastline not readily available to regulation Naval planes, our Air Corps is now ready to rush hundreds of giant and powerful bomber-seaplanes into the breach. The range and potency of these Air Corps flying arsenals is only slightly less than present Naval bombers of a similiar catagory and they can be placed into service unit for unit of disabled Naval patrol boats.

This new cooperation between our Army and Navy air arms marks a distinct forward step in the more efficient operation of our aerial defense. Our Navy's fighting and scouting planes stand instantly ready to aid our Army craft in the efficient dispatch of inland missions. Designed basically as landplanes, some of these Naval models are even identical to Air Corps types now in service. In such cases the complete interchangeability of fighting personnel is possible. Our Army bombers stand instantly prepared to aid our Navy aircraft in the engagement of enemy planes and surface craft far at sea. Our Army and Navy aviation sections are now standing shoulder to shoulder in the defense of these United States. All

The Army has been a good customer of Sikorsky for many years. Latest Sikorsky type purchased by the Army is the famed S-43 shown above.

The generals have even experimented with sea-going Army bombers. Quite a number of flights were made in and out of New York with this Martin.

Here is the famous "world cruiser" of the Army Air Corps. A flight of these airplanes made that memorable round-the-world flight of 1924. Originally a landplane, this ship has its floats for the ocean hops.

thought of service loyalty or high command technicalities would be abolished in time of aerial attack by imperialistically inclined enemy nations. Any break in our lines of defense would be instantly filled regardless of on whose shoulders the duty lay. Our aerial soldiers and sailors may be fighting wing to wing in our next encounter should such a catastrophe once again overtake us. Petty jealousies would be overlooked in the defense of our shores. Painfully slow but nevertheless surely we are advancing towards the goal learned military strategists have set: a unified air force. That day will be not far in dawning is easily seen in the progress our airmen are making today.

Not only is the Army going to sea of its own accord, but the Navy, once a sort of friendly arch-enemy of the "mud-sloggers", is lending a helping hand. Much of the Army's basic knowledge concerning over-water flying has lately been passed on by Navy aviation men. In other words, the Navy has had—and has today—much to do with Uncle Sam's soldiers taking to water.

Where the Army Air Corps once exerted all its energies to keep its status as a land-going organization impeccable, the modern Yankee soldiers of the air are showing more and more of the better traits of a sailor. High Army officials have decreed that most Army planes stationed anywhere near water be equipped to deal with that water—even in emergency. This is partially illustrated by the fact that the latest Air Corps Curtiss P-36 fighters all carry flotation gear as standard equipment.

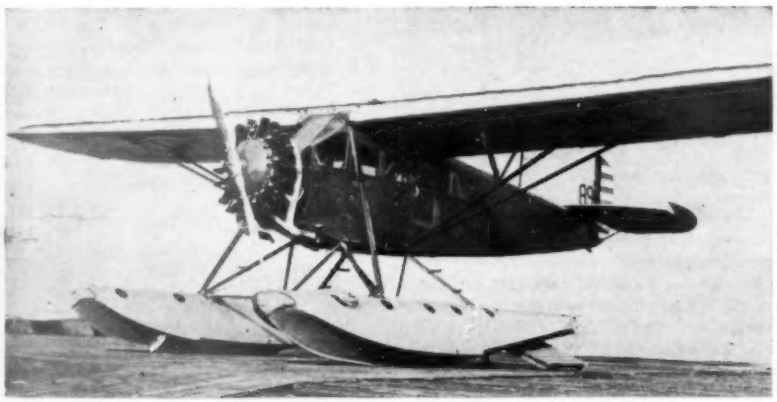
The first time the Army went to sea with any degree of prominence attached to the occasion was in 1924. In the early part of that year a flight of Douglas-built Army "world cruisers" as they later became known, "set sail" from the Pacific coast on a round-the-world flight. Though the Air Corps may not have liked the over-water part of the cruise, they were forced to accept it. So Army engineers somewhat reluctantly traded the wheels of the old Douglases for pontoons and Capt. Lowell H. Smith and Lieuts. H. H. Ogden, Eric Nelson, Leigh Wade, Jack Harding and Leslie P. Arnold were off to make their names as the Army's first sailors. These officers are shown in the photograph on page 11, reading from left to right in the above order.

If ever the Army Air Corps has gone to sea—either before or since—it was on that memorable flight. The ships' old Liberty engines dragged the flying soldiers to historical fame over that 28,000-mile course in 371 hours and 11 minutes of flying time. The flight left Sand Point at Seattle on April 5, 1924, and made their final landing upon arriving back in the United States at Seattle on September 28, 1924.

At best, though, that flight was a stunt. But today it's a different story—and becoming more so daily. The Army Air Corps has definitely become a customer for the manufacturers of flying boats and amphibians—mainly at present at least the latter.

Several long-distance test flights are contemplated by Air Corpsmen in the near future. Strangely enough, these new pioneering Army flights will (like that first round-the-world flight) be made with a Douglas airplane. That ship sports the GHQ Air Force insignia at the top of the opposite page.

END



Not only is this old Fairchild "71" the Army's favorite photographic ship, but it also is an old standby with water-flying service squadrons.

The famous old Loening amphibian below was one of the most widely used sea-going Army planes in Air Corps history. Many still are in daily use.

Swanee Taylor SAYS...

Clear & Unlimited . . .

Rumors keep drifting back that His Imperial Majesty's Ship *Idzumo*, biggest battlewagon in the Japanese Navy, got the living whey knocked out of it by Shanghai's air defense; that little handful of aviators who went to war with the odds stacked 5-to-1 against them.

The proud *Idzumo* had steamed up Soochow Creek to drop anchor in the heart of the peaceful part of Shanghai, just a little less than 600 airline feet from the busy Sincere Department Store. From which strategic point her gunners proceeded to lob high explosive shells across town against the rear of the Chinese infantry then holding like a stone wall before Chapei. It was a cunning piece of strategy which could be matched only with desperate steps. So the Chinese High Command called on its air arm to remedy the situation.

There is no call for an apology here for the bombs that fell on the unfortunate souls in the department store. The Chinese were fighting for their lives and desperate measures can easily be regarded as pardonable. What makes the Sincere Dept. Store bombing entirely "justifiable," however, is the fact that most of the Chinese bombs found the target. Those few that did hit the store were the widest misses of the lot. Which wasn't such dusty bombing no matter how you look at it.

But what is most illuminating (if you believe the rumor) is that the engagement marks the first victory of aerial bombing over a capital ship. And it apparently was a decided victory. For, despite what all the theorists say about battleships being invulnerable to air attack, reliable eye-witnesses report seeing a badly battered Japanese naval craft being towed out to sea in what seemed to be a sinking condition. What makes the report more convincing is the fact that on the very next day an altogether different ship took up position off the mouth of Whangpoo River. On its stem and stern, painted in large characters for all to see, was—*IDZUMO!*

Cancer of the Gov't . . .

Due to a procrastination typical of most cancer sufferers, a malignant growth called Bureau of Air Commerce has been allowed to spread to such extremes that an immediate amputation is the only cure. Also, the only surgeon capable of making the operation is . . . Dr. Congress.

There should be no need of saying that all doctors, Congress included, must necessarily be summoned and made aware of any sickness. They are not clairvoyant and can't guess the world's ills. Therefore, we had better stop braying down-wind and put in a direct call to old Doc Congress. Beseech him to come right away and bring along his biggest knife.

When I say we, I mean all of us, everybody who knows or cares anything at all about our poor sick Air-body. Which, by the way, includes a host of aviation stock holders all over the country. They are the ones hardest hit by the disease; it hits them smack in the pocketbook.

A tip-off on how the virulent germ, *bureau air cancerous*, has spread beneath our gov't's skin came to light recently in a story broken through the "Daily Washington Merry-Go-Round." It told of a special—and very hush-hush—concession on fire prevention at sea which was given to rich, potent Dollar Steamship Lines by Col. James Monroe ("Rowboat") Johnson, Ass't Sec'y of Commerce. The exemption granted rode roughshod over duly enacted legislation that had been passed to prevent another tragic *Morro Castle* blot on our mongrel merchant marine. But it would have saved the company nearly a quarter of a million—had the President not stepped in.

Whether Col. Jimsey-Wimsey acted alone in the matter or under orders I don't profess to know. Nor do any of us care whether his motives were good, bad or indifferent. The excruciatingly painful fact remains that a public servant, charged by law with specific protective duties, did for whatever the reason violate his trust. And what makes the ache more personal, this self-same "servant" is currently Chief Fly-cop to the Aeronautical Industry.

Yet, again, I remind you that old Doc Congress can't divine our state of health, he's got to be told. Too, Aviation still is small potatoes as far as our complicated government is concerned. Which fact, coupled with our highly technical nature, makes it all the more imperative that we, the people who know, give the doctor all the assistance possible.

Another thing that you might keep in mind when you worry about our woes, is the Industry's great unwillingness to speak up for itself. The reason for this being that since 1914 Aviation has taken so many repeated kickings around from Congress that a policy of silent suffering is rigidly held to. If anyone does dare to speak up in righteous protest, likely as not the Gentleman from Milldew, N. J., is apt to pounce on the words and garble them to suit his own appetite for personal publicity. Else, in his blithe lack of knowledge, he is ever the sucker for purposeful billygoats seeking to further their own ends. But in either case the result is always the same:

(*Concluded on Page* 82)

Whew! A Close One!

LIEUTENANT GEORGE BEVERLEY, courtly Virginia gentleman, had to forget his Cavalier training and make a most undignified exit from a spinning plane a few years ago. It is said that he has never flown in boots since, for he attributes his whole neck to the fact that he was not wearing them that day.

He was on leave from the Army Air Corps and was testing a new type of ship for a commercial concern. The plane objected in a manner most emphatic to the rough handling of test routine and proceeded to take the bit in its teeth and head for earth via the shortest route—the straight line. Moreover, it spun violently like a broncho trying to free itself.

Beverley bailed out, but as he did so his foot became wedged between two struts and stuck tight. He struggled to release himself but found that he was as helpless as if he had stepped into a steel trap. Round and round the plane whirled him like a girl in an adagio dancer's arms.

Doubling himself up as best he could, Beverley unlaced his shoe, breaking all speed records for that operation. Then he was hurled clear of the plane, yanked the rip cord and made a safe landing, minus one shoe. Beverley states that had he been wearing boots he believes he would have been killed.

Move Along, Fisherman . . .

AIRPLANES have been put to so many uses these last few years that we're not surprised at anything. Not even the job that the United States Marines at Quantico, Virginia, have given an ancient Loening amphibian.

It seems that the Army does much of its artillery firing practice in the vicinity of Quantico. Being on the coast, of course, the guns take advantage of the nearby Atlantic and conduct their firing in the direction of the ocean.

No matter how many government warnings have been issued in the past, however, there seems to be a little reluctance on the part of many Negro fishermen to get out of the way. The easy-going Virginia and South Carolina colored lads had been paying no attention to the warnings and could be found lounging in the noon-day sun with fishing poles hanging over the sides of their boats. The fact that artillery shells whammed mightily all around seemed to make no difference.

Frantic Army officers finally found the solution to their problem in an old Marine Corps Loening amphibian. Today, the amphibian has the none-too-simple task of exploring all inlets, bays, bayous, etc., to chase all occupants out of the danger zone. Seems the amphibian was the only answer, too, for mere zooming Army airplanes wouldn't faze the easy-going darkies. The Loening, however, lands right beside the fishing boats and sees to it that they move.

Frisco's man-made island from the air.

SAN FRANCISCO LOOKS BEYOND ITS COMING EXPOSITION TOWARD...

Tomorrow's Airport

This is what the 1939 San Francisco exposition will look like when complete. The road running off the bottom of the picture goes to the famed Bay bridge.

MAYBE you've noticed that it's been quite a while since you saw an "artist's conception" of a city with a nice flat roof over the business district—a roof that was going to be a downtown airport, with elevators direct to the subway station.

Maybe this idea has blown up without even leaving a thud—but it was a nice idea while it lasted. No doubt the Department of Commerce preference for runways of 5,000 feet and more, and the crushing impact of a 40-ton transport landing at speed, throws too much of a strain on a roof for even an artist to conceive, even though assisted by a poetic license.

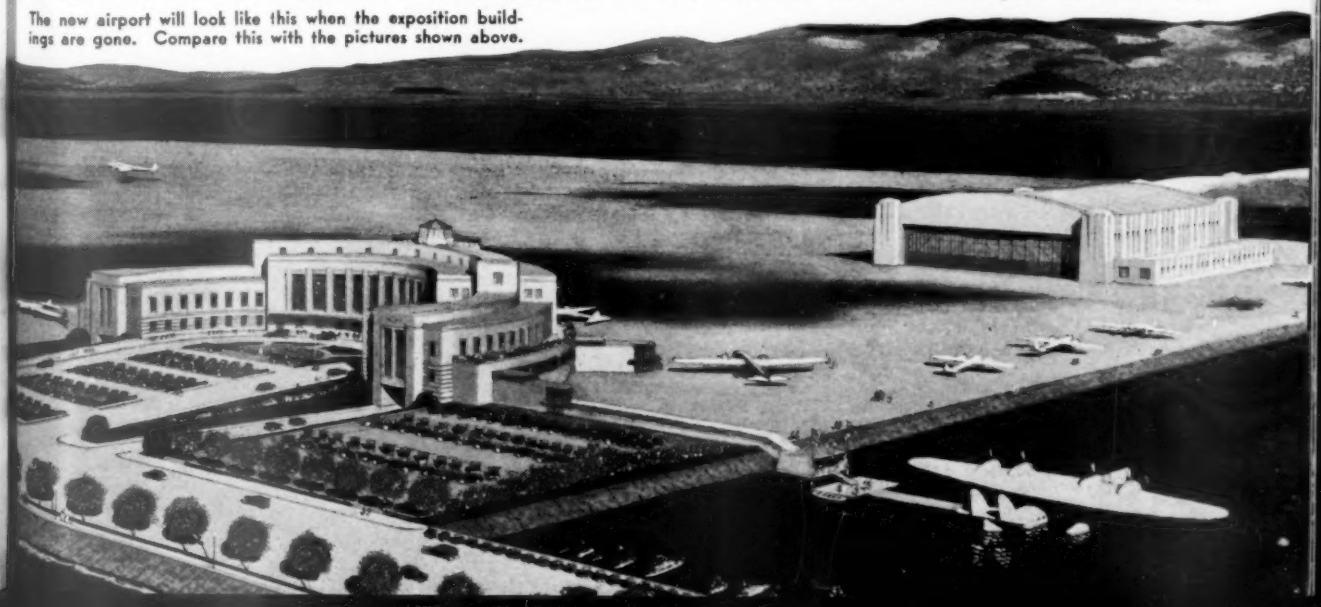
Anyhow the "roof airdrome" theory has gone away; airports are still clinging to the outer fringes of civilization, with the downtown district getting farther and farther away as traffic congestion piles up in front of the airline bus. Something just has to be done about it. . . .

The San Francisco Bay area has done it, in a way that no other community has—and few other communities could. A highly specialized and actually central airport, valued at $7,000,000, has been added to the string of specialized municipal and military fields that ring the Bay region.

This spectacular solution of a problem that's universal is a 400-acre island, a mile long and three-quarters of a mile wide, dredged from the bottom of San Francisco's harbor. This largest man-made island in the world lies within ten minutes of downtown San Francisco or central Oakland, focal points of a metropolitan population of about 2,000,000 people.

Although this ideal island airport was completed in 1937, "Treasure Island" will not take its place on the air map

The new airport will look like this when the exposition buildings are gone. Compare this with the pictures shown above.



before 1940. It will be monopolized in the meantime by construction and operation of the 1939 Golden Gate International Exposition, the $50,000,000 western world's fair that sponsored WPA and PWA appropriations accounting for almost the entire cost of the airport.

Treasure Island stands 13 feet above tidewater, and its 20,000,000 cubic yards of sand fill are bound by a rock sea wall. It was dredged from the bottom by U. S. Army engineers at a cost of $3,803,000, and its permanent buildings—two huge steel and concrete hangars, and a three-story air terminal building—are practically completed, for temporary World's Fair occupancy. Other items in the Exposition's construction program will be removed from the runways at the close of the 1939 Fair.

Tentative plans for final development call for runways ranging from 5,000 to 3,400 feet in length, with a preliminary width of 300 feet. The prevailing-wind runway, probably a double strip, will be 3,900 feet long, and entirely clear of interference for landing or taking-off. A protected cove between Treasure and Yerba Buena Island will serve as a mooring basin for seaplanes, and its 50-foot depth will handle ships of the line in case this municipal airport is "nationalized" during an emergency.

Transportation, for airport purposes, will be ideal. A direct highway across Yerba Buena Island, where the San Francisco-Oakland Bay bridge becomes a tunnel, ties the airport to this great $77,000,000 traffic artery, where speed is not only possible, but essential. Bridge approaches, naturally, are strategically placed for business districts on both sides of the harbor, and delays in ground travel will be negligible.

Today's flying picture is not the flying picture of 1940, so the responsible parties are planning Treasure Island in terms of aviation two years hence. It will fit with a click, then, into the complex network of private, transport and military activity that is making San Francisco Bay the aerial junction point of the western hemisphere.

Looking first at civil aviation, San Francisco has its present airport on the South Bay—remote, but capable of unlimited expansion. Some long-range transport will stay right there, in the opinion of B. M. Doolin, airport manager for the San Francisco Public Utilities Commission, although there are authorities who are convinced that public pressure will insist upon fair-weather operation from convenient Treasure Island.

San Francisco Airport, at any rate, probably will remain a logical field for landing control systems requiring extra long runways; for terminal shops, airplane factories and storage. Training and instruction, which does not mix well with scheduled operation, already is trending toward ideal conditions in the East Bay area.

Thus Treasure Island will serve the greatest number. In addition to serving transcontinental lines, it will be the base for shorthaul "shuttle" transports—

(*Concluded on Page* 84)

THOSE in the know in Washington say the biggest aviation headlines since the 1933 abrogation of post office contracts with U. S. domestic airlines, now is brewing. . . . It involves Pan American Airways System. . . . The President and cronies want to take it apart and see how Pan Am got its $2 per mile contracts with a Republican-controlled post office.

Pan Am's Juan Trippe, as astute a politician as any in congress, knows the fight is crucial. . . . He's rallied to his support the Army and Navy boys who protected him while the domestic lines caught hell. . . . And meanwhile he's pulling all wires in an effort to assure himself a mail contract for the North Atlantic next summer. . . . This fight may never get out from behind the scenes if Pan Am wins, but the betting is that the President will have at least one inning this winter.

* * *

Had you heard how the propeller experts of the U. S. have confounded themselves with their latest wind tunnel tests? . . . They've been working for years to develop a propeller which could be fully feathered to reduce the drag of an engine stopped in the air. . . . Now that they've got a couple of different type propellers perfected for feathering they discover a free wheeling propeller is better than a feathering blade. . . . They're tearing their hair.

* * *

We don't know whose idea it was, but American Airlines burp cups—you know, the cardboard containers into which airsick passengers snap the cookies—now bear a message. Neatly printed on the container top are the words "Thank you. Call again soon."

* * *

Friends of a famous test pilot who did much work for the Navy and for military airplane manufacturers a couple years ago, are worried. . . . He's been drinking hard for months and his nerves are gone. . . . They're afraid a great guy and great pilot are shot-to-hell.

* * *

Begin watching for airplanes with the tricycle landing gear. . . . There's a whole new crop on the way . . . high performance stuff as well as safety planes, too. . . . Stinson, Bellanca, Fairchild, Howard, Boeing and Glenn L. Martin all are toying with new tricycle gear designs. . . . And of course Douglas, Stearman-Hammond, Waco and Gwinn are already out with them. . . . Benny Howard's new design will be a 200 m.p.h. six-place high wing monoplane with two Menasco CoS engines, and the nose wheel will retract along with the two main wheels.

* * *

Cockpit trouble . . . it's the same old story that's going the rounds again . . . this time it's United Air Lines' crash in Utah . . . but this time the old story has a bit more unpleasant angle to it . . . for the first time in the history of airline operations, a recording device was aboard the ill-fated airliner . . . the barograph, according to reliable sources, points an unerring finger at the cockpit . . . still held by the Bureau of Air Commerce as "evidence," the United barograph, it is said, shows that the airliner was being flown by the gyro-pilot at the time of the crash . . . and it also shows that the pilot had simply climbed the ship to 10,000 feet, switched on the automatic pilot, and headed into the mountains . . . and so far as that radio-static business is concerned, Federal regulations demand the instant retracing of the flight track as soon as reception is drowned out by static . . . it's difficult to understand why the pilot continued at the 10,000-foot altitude.

* * *

Incidentally and quite on the hush-hush side, United now is equipping its planes with oxygen for pilot and co-pilot and for the stewardess, who really needs it worst of all at great heights. . . . She's the only member of the crew required to do any physical work. . . . The new equipment, only temporary in nature, will permit the stewardess to give oxygen to passengers who might need it. . . . All this indicates that the company is going to demand really high flying from now on over the mountains.

* * *

Pity Pilot Louis P. Hulett of American Airlines. . . . He shot himself in the pants with his own gun. . . . The story now is that he rides with a pillow under his right cheek. . . . He really did it himself, dropped the gun on the floor of the pilots' room at Memphis.

* * *

Roscoe Turner's now the middle-western sales representative for the Stearman-Hammond safety plane. . . . Sorta different for a speed king.

* * *

Watch the newspapers for a national story on an impending divorce of a world famous speed pilot. . . . He and his wife separated recently and she has taken the case to a lawyer. . . . There'll be news stories on the filing of a bill any time now. . . . The thing's the more surprising because she's always been known as a devoted wife.

(*Concluded on Page* 95)

Mr. Bellanca Builds a Racer

For a conservative American manufacturer like Bellanca to alter his ways to the extent of a high-speed, long-range racer is aviation news worthy of mention.

FOR many years Bellanca Aircraft has been turning out good, conservative—and high-priced—airplanes. Throughout all these years, though, that consistently conservative air was maintained with Bellanca products until, it might be said, the announcement of the London-Australia air race of a few years ago. Then Bellanca took what might be considered its first "radical" plane-building step; the Bellanca *Flash* was specially built for Col. James Fitzmaurice, famed Irish ace. The ship was such a success that Air France, the national airline of France, ordered a whole fleet of them. By a coincidence in the October issue of POPULAR AVIATION, we hinted that the Air France Bellancas might make ideal warplanes for China. A few days after, the press of the country carried the story bearing our prediction out.

Since the success of that first "radical" type (Model 28-90), Bellanca has announced a new line of aircraft. The ship on this page is primarily a racer (Model 28-92) though some sportsman pilot may see it as the airplane he has sought.

Capt. Alexander Papana, dashing young ace of the Roumanian air force, had this Bellanca built especially for a good-will trans-Atlantic flight from the U. S. to his homeland.

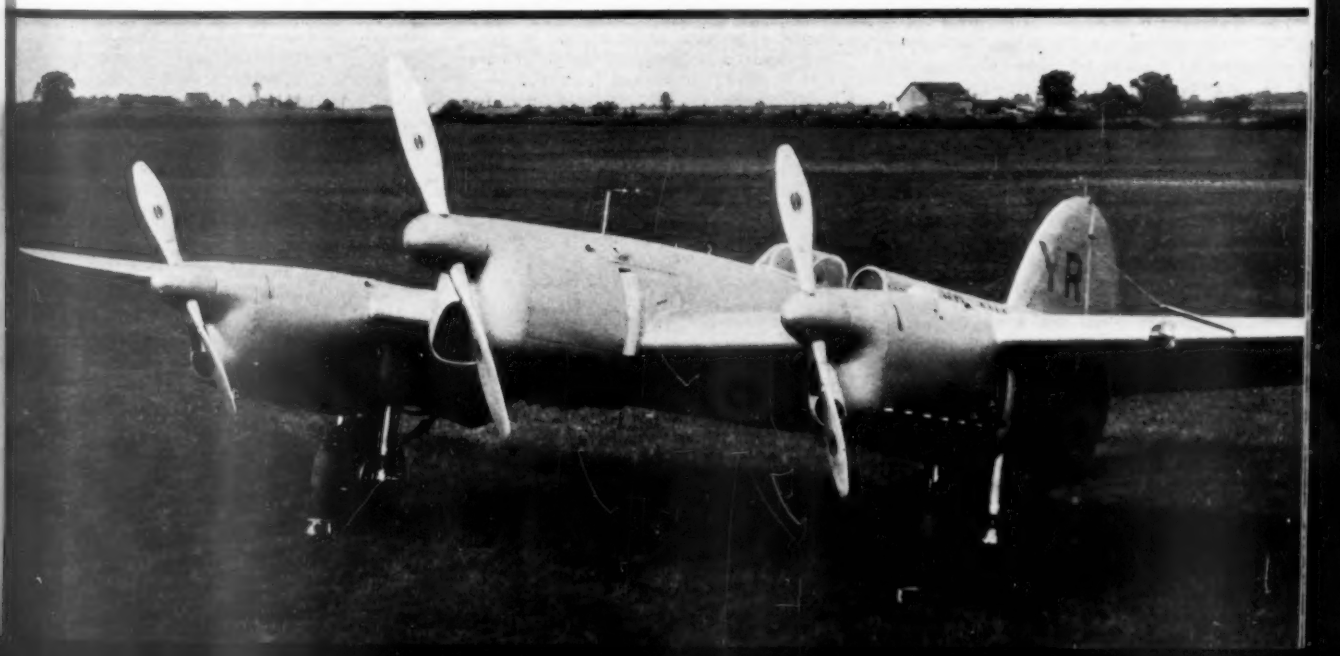
Typical of Bellanca construction, Captain Papana's new racer is built as ruggedly as an airplane can be. The photographs here demonstrate that. But with all its ruggedness, the 28-92 has performance plus. According to Bellanca engineers (no actual flight-test data is available at this writing), the 28-92 has a rated top speed in the vicinity of 250 m.p.h. and a cruising speed of 225 m.p.h. Though the ship's range is not known, it does carry 900 gallons of fuel which, by roughly estimating the three engines' fuel consumption per hour, gives the 28-92 a cruising range of about 3,000 miles.

Captain Papana's Bellanca is powered by three in-line engines. The nose engine is a 12-cylinder, 420 h.p. Fairchild *Ranger*. The two outboard engines are 250 h.p., six-cylinder Menascos. All three are air-cooled. Controllable-pitch propellers also are standard equipment.

Wing span of the 28-92 is 46 ft. 4 in., length is 27 ft. 8 in. and the total wing area is 282 sq. ft.

The latest in equipment also is included in the new ship. Papana has a two-way radio transceiver that operates on two wavelengths. Blind flying equipment is included and a new radio compass also has been installed.

Sturdiness and streamlining are exemplified in the photographs at the top and bottom of this page. Capt. Papana is expected to fly this ship non-stop across the Atlantic soon.



the NATIONAL AIR BOARD Says...

Dr. Alexander Klemin, Chairman

MANY distinguished guests attended the 18th meeting of the Air Board, among them Dr. Arthur Doremus of the Crocker-Wheeler Company, Frank Russell of *National Aviation*, Grove Webster of the New Jersey State Aviation Association, and Dr. Cooper, of Diffin and Cooper Products.

BERYLLIUM

First hand information was received from Dr. Cooper concerning that promising new material, beryllium, whose physical properties are of so fine a character that its application in aircraft might revolutionize the whole industry and make aircraft structures some 40 percent lighter. Hitherto the price of beryllium has been far too high for its use in aircraft. Now its price is dropping rapidly and we should, within a few years, realize its wonderful possibilities.

Beryllium, Dr. Cooper told the Air Board, is of the same general family as magnesium or aluminum. Its specific gravity is only 1.8 and it is 35 percent lighter than aluminum, yet its modulus of elasticity is equal to that of steel. It is, however, relatively brittle and must be alloyed to give the ideal metal. The addition of aluminum or copper to beryllium produces the same excellent improvement as the addition of carbon to iron in producing steel.

When nickel or copper or aluminum is added to the native beryllium enormous strengths are obtained ranging from 100,000 pounds per square inch to 200,000 pounds per square inch. The corrosion resistance properties become remarkable and the specific gravity still remains exceedingly low.

The next great step in beryllium metallurgy will be the combination of its extraordinary lightness with good expansion. Then we shall see its application in ribs, spars, and covering, leading to the remarkable reduction in weight that we have spoken of above.

Of course this is all predicated on lower prices. At present the price of beryllium is $23 per pound. The original ore, beryllium silicate, is found in great quantities throughout the world, but it is composed mostly of silicate and some aluminum, with only a small proportion of the pure beryllium. The problem is to extract the beryllium and separate it from the aluminum which is chemically so close to it that the problem of separation is difficult. With present electrical processes of recovery, 75 percent beryllium is obtained, but all processes are difficult and expensive.

SEALING DUMP VALVES

Much adverse criticism by Air Board members has followed the recent Bureau of Air Commerce ruling that all gasoline dump valves on airplanes must be sealed. This order has been characterized as akin to bolting a fire escape of a tenement or shutting off a safety valve of a steam locomotive. The order comes suddenly, somewhat arbitrarily, and has been a shock to the industry. It is a great measure of safety to be able to dump the gas tanks in a difficult landing. Recently an American Airlines pilot was an hour and 15 minutes in the air above Newark trying to get a damaged landing gear to function. He subsequently made a beautiful one-wheel landing. But certainly safety would have been greatly increased had the fuel been dumped.

What was the reason for this rule? Mr. Quick gave the board the most adequate explanation. Tests with dump valves had previously been made with water and were entirely satisfactory. When tryouts were made with gasoline the situation changed. The gasoline vapor flowed into the back of the ship. Vapor collected at dangerous spots such as proximity to the motor generator, thereby a great hazard was actually introduced.

Obviously the fire hazard must be carefully regarded, but there is no reason to doubt that dump valves can be readily designed which will guide the gasoline away from danger spots on the airplane. Gasoline is so volatile that once discharged, it dissipates rapidly and can cause little danger on the ground. The heavily loaded Clippers, though, must dump their valves before landing so as to keep within the 70 m.p.h. landing speed.

The final concensus of opinion of the Board was that dump valves are an important element of safety; that the mechanical design of a scoop or other device to prevent accumulation of gasoline vapor is a relatively simple matter; that the Air Commerce Bureau will do well to reconsider its hasty order.

Incidentally, may we remind our readers that the $250 safety award of the Air Board is soon to come up for decision. A dump valve immune to the dangers discussed above would be a contribution to safety well worth consideration by the Board.

CLEARING THE MOUNTAINS

This question was asked in view of the recent accident where an airliner was destroyed when flying at 10,000 feet:

"Why, when flying in mountain ranges do pilots not fly higher than the highest peak?"

The answer is that the airlines are fully aware of the necessity of flying high, that the Department of Commerce

(*Continued on page 92*)

Long Range Eating

HOW long does it take to eat a meal? Approximately 75 to 125 miles if you are flying, according to Stewardess Elvira Laine, who flies regularly between New York and Chicago on American Airlines.

Reduced to more prosaic minutes, Miss Laine explained, 100 miles of food actually represents from 30 to 35 minutes in the air, and this is about the average time the passenger devotes to his aerial dinner.

"Several girls flying out of Newark were in a hotel room one evening between runs when the conversation turned to the subject of food," Miss Laine said. "After more than an hour of banter the following menu, reduced to terms of statute miles, was evolved:

"Soup or bouillon	25 miles
Salad	20 miles
Main course	40 miles
Dessert	15 miles
Total	100 miles

"This, of course, is merely an approximation and does not include a few miles necessary to consume the olives, pickles, nuts, mints and other incidentals which supplement the regular meal.

"Forty miles for the main course is based on chicken pot pie, one of our most popular entrees. Fried chicken, also very popular, can easily run as high as 60 or 65 miles which, of course, would increase the total miles for the entire meal."

Miss Laine said very few passengers ever thought of reducing their food to terms of statute miles but admitted she occasionally encountered someone who found this a diverting method of spending time on the longer flights. The longest meal on record, she said, covered a distance of more than 400 miles and was planned and executed by a passenger who made her attest to the feat.

"Early last spring, on an eastbound flight from Chicago to New York, I began serving passengers their luncheon shortly after we passed over Niles, Mich. One passenger was studying his route map when I approached with the bouillon course. He requested specific information as to our position, and I placed a check mark just opposite Battle Creek, Mich.

"He began to eat but with an amazing lack of appetite. He spent the first ten minutes munching olives and celery, and I began to worry about his bouillon getting cold before he took his first mouthful. We had passed Detroit, and were skirting the shores of Lake St. Clair before he swallowed the last of his soup and signalled for his salad. He had spent more than half an hour on this one course!

"Thinking to save time, I offered him his entree, which happened to be fried chicken, with his salad. He declined, declaring he was in no hurry and asking me to keep it hot for him until he was ready.

"As we approached Strathburn, Ontario, some 60 miles distant, he surren-

(*Concluded on page 74*)

Britain's Hitch-Flyer

Leave it to John Bull to think up something like this. Climb right on up.

A GENTLEMAN by the name of Mayo had an idea some years ago. The photographs on this page show what even you can do with an idea—providing, of course, you are of the same aeronautical caliber as Mr. Mayo. Today, aviation circles over in the land of the four o'clock tea are clucking wonderingly at Mr. Mayo's idea. Not the two airplane as two airplanes, but at the two airplanes as one airplane—more or less.

It was originally intended (it still is, for that matter) that Mr. Mayo's brainchild be the sought-after answer to the trans-Atlantic operator's dream. The whole business goes something like this:

Flying the ocean (any ocean) is an expensive proposition when it's done like Imperial Airways and Pan American Airways have been doing it. To do the job safely, these present-day ocean-flying boats are forced to sacrifice a lot of valuable payload for fuel. That's the reason Pan American Airways' *China Clipper* actually carries a maximum of nine passengers between Frisco and Hawaii—though that airplane is listed as a 48-passenger boat. The missing 39 passengers are sacrificed mainly to the carrying of mail, express—and extra fuel for the 2,440-mile flight.

So Mr. Mayo believes he has solved that problem this way. As you can see here, he has perched one airliner on top of another. The top one is heavily loaded—abnormally so, in fact—with whatever Imperial Airways wants to fly across the ocean. The bottom boat (almost a duplicate of the British boats now operating between New York and Bermuda) is empty. Atop the latter's wing is a hooking device. The heavily loaded "hitch-flyer" is placed on the big boat's back with a crane. All eight engines are started, the whole affair is supposed to take off, climb to 10,000 feet then, at a given signal the hook is unhooked, the top plane zooms, the bottom ship dives. But don't be misled. This has yet to be done. This test cannot be made till the Air Ministry approves the ships as safe. And the Air Ministry is somewhat up in the air because they've never worded the regulations for such a contraption.

TODAY'S QUESTION: IS STATIC THE

By A. R. LEAKE . . .

. . . instructor in an electrical engineering school, who advances a startling theory in connection with airline crashes.

EVERY winter records a number of air crashes and the winter of 1936-7 was notorious in this respect. And, when airliners increase in size to carry 40 or more passengers, it becomes increasingly urgent that the cause of crashes be found and remedied.

For this purpose, crashboards examine the wreckage and write elaborate reports giving what they believe to be certain or possible causes. Testimony of

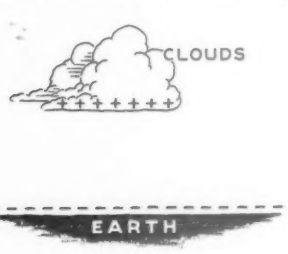


Figure 1

witnesses or those persons living near the crash is taken, and experts puzzle over the meaning of their observations. The net result is that planes of identical type and manufacture still crash and the reasons assigned are as varied as ever.

In the fall of 1936, the writer became convinced that, in many crashes, the real cause had not been discovered. In most cases, no fault in either the airplane structure nor the mechanical functions of the engines was found, some engines operating perfectly when started after the crash.

I, therefore, undertook a careful study of all available information, including crash reports, in the hope of finding some common factors which would indicate a solution of the problem.

Data on altitude and location of the crash, the weather, reports on the functioning of the planes, radio apparatus and motors prior to the crash and other factors were tabulated and considered.

Study of this evidence showed that, while some crashes might be due to failure of the radio or to the pilot being off the beam, equally serious crashes occurred when planes were operating in daylight and in sight of the airport and were, therefore, not dependant on radio reception nor the radio beam for proper navigation.

Practically all crashes occurred either in months favorable to a charge of static electricity accumulating on the plane, or under weather conditions where a cold-front or the presence of dust pointed to possible static accumulation.

Definite cases were discovered of crashes following engine stoppage during weather favorable to static formation. As some of these occurred when the temperature and moisture conditions favored ice formation, investigators had attributed some crashes to ice formation in the carbureter.

While ice in the carbureter is possible under certain conditions, few reports indicated that such ice had been found after the crash. When an engine stops, the hot air-blast passing from the cylinders and over the carbureter also stops and it seemed reasonable to believe that, under this condition, carbureter ice would not melt away in freezing winter weather before the wreckage could be examined.

Furthermore, few crashes occurred during through flight over level country, irrespective of flight altitude or the temperature and moisture conditions, while many others occurred in mountainous terrain.

Numerous crashes on mountain tops, or in fog near airports, were attributed to error on the part of the pilots. To the writer it seemed unthinkable that experienced personnel having an altimeter and other instruments available, would drive a plane into a mountain if it was humanly avoidable. Or, that pilots would turn so close to the ground in a fog as to strike on a wing tip and wreck the plane when such turns are known to be dangerous.

It appeared to the writer that the only common factors in the crash data were: (1) static charge on the plane. (2) decreased radio reception and (3) maneuvers prior to the crash which might indicate reduced engine power output.

The next step was obviously to check these factors against numerous crash reports. If engine failure and radio reception difficulties could be connected with static charges on the planes, then the cause of crashes would be known and a method found to correct it.

The fact that planes accumulated static under certain conditions was well known. In the attempt to streamline the planes to reduce air resistance, projecting bolts, wires, safety wires and sharp edged or pointed projections of all kinds had been eliminated from the surface. Thus, the modern metal plane retains a static charge as does the polished terminal ball on a static machine in the laboratory. Besides, the increased speed of the planes had been found to generate more static under certain weather conditions, such as dust, rain or snow.

The reduced efficiency of the radio apparatus, when the plane became charged with static, has led to many attempts to change the radio equipment so as to neutralize the effect of static. Positions of receiving aerials and their shape has been changed and the shielded receiving loop has been adopted as an improved type of aerial that is less subject to static effect.

The possible effect of airplane static

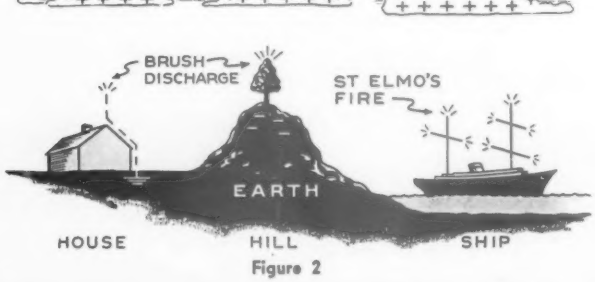


Figure 2

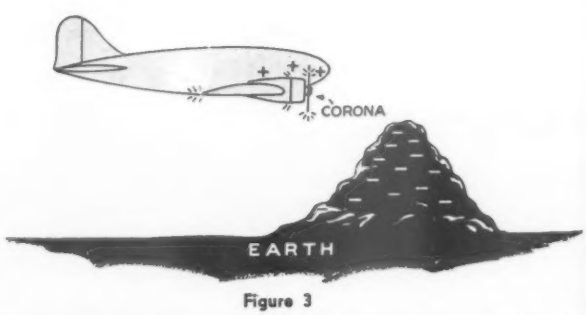


Figure 3

E KILLER?

Recent airline crashes have once again brought up the old subject of "why"? Maybe Mr. Leake's theory is the answer. Who knows?

charges upon the airplane engine has not, to the writer's knowledge, been investigated or even considered. In fact, when it was suggested to a leading research agency of the government as the cause of planes failing to clear the top of a hill, the reply stated that there was not enough charge on the plane to pull a plane to the ground and enclosed a bulletin giving the amount of charge on aircraft.

Nevertheless, it was possible to unearth evidence that static could stop a gasoline engine. Several years ago, a scientific magazine reported that motor cars had been stopped by dust storms in the west.

Finally, an individual was found who had personal knowledge of auto motors being stopped in a dust storm and being started again after an iron chain had been hung from the car axle to the ground. Certainly, such stoppage was not due to ice in the carbureter as ice does not run down a log chain during a Kansas July.

If static stopped an airplane motor, or reduced its speed, when would this be most likely to occur? Evidently, when the static charge accumulated over the plane had been shifted so as to be concentrated about the motor positions. This would occur when the motors formed that portion of the plane relatively closest to some body having a charge of opposite sign, or the relatively remote portion if the charge on the body was of the same sign.

There are few records of planes with low motors crashing when near ground with their landing-gear extended, and even fewer recorded crashes of flying boats with motors on the wings.

Such shifting positions and concentrations of the charge are best understood by considering a charged cloud moving over flat earth as in Fig. 1. Such a cloud induces an opposite charge on the surface beneath, and both charges are spread out and distributed.

If the cloud (Fig. 2) passes over an elevation, such as a hill or a house, the charge on the cloud and on the surface below becomes more concentrated and the voltage between the two charges is increased.

With a sufficiently high voltage, either leakage of the charge occurs, as the St. Elmo's fire on the masts of ships, or the air between the charges is broken down in a lightning flash.

Where sudden discharges are probable, due either to the elevation of an object, or by lack of sharp discharge points connected by conducting paths to earth, then pointed discharge wires are provided to permit the charge to leak away before the voltage increases to the flash-point.

A charged aircraft is, in effect, an artificial cloud and its electrical action is similar. Depending upon its relative position with respect to the earth, structures, or clouds, the aircraft's static charge is either distributed over the plane or concentrated in certain portions. See Fig. 4.

If the charge on the aircraft accumulates until the voltage is sufficient, brush discharge or corona is at a maximum where the radius of curvature of the surface is small. Such locations are on the trailing edges of wings, control surfaces, fuselage, propeller edges and the other edges of thin sections such as occur on motor cowlings. Some are on the landing-gear, engine parts, etc.

When the charge is distributed, corona will take place from sharp edges about the aircraft. A plane flying in a narrow valley will have some of the charge attracted to the outer portion of the wings. If the plane emerges from the valley, and flies close to the ground, the charge will leave the wing tips, and concentrate about the low-wing motors.

As a charged plane approaches an elevation, Fig. 3, the charge will shift to the lower front of the plane, due to the attraction of the induced charge. As it leaves the elevation behind, the charge will shift to the rear.

If static discharge about the motors reduces their speed under certain conditions, this effect should occur when the plane approaches a hill or other elevation and the speed of the motors should increase after the elevation has been

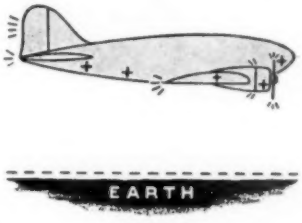


Figure 4

passed. This would imply variable altimeter reading as the plane passed close over the tops of hills, and failure to clear the top of a hill on account of reduced air speed near its crest.

It is interesting to note that many planes crash near the top of hills. The writer has two photographs, one showing an American plane with its nose on a railroad embankment and its tail in a pasture, while the other is that of a British plane, with its nose on a hill and its tail on the level ground. (Fig. 5.)

Crash boards often state that marks made by propellers on crashes indicate that the engine was turning at normal speed when it hit the hill, but with controllable pitch propellers the pilot may have reduced the propeller blade angle to keep the proper engine revolutions.

In such cases, evidence of proper revolutions of the propeller would not

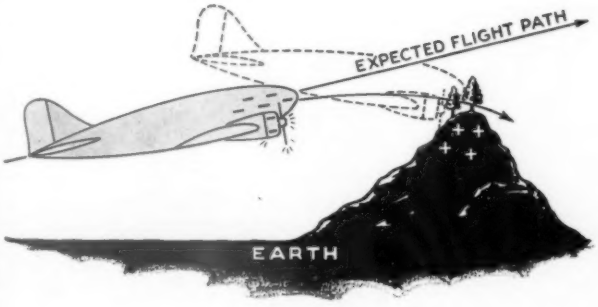


Figure 5

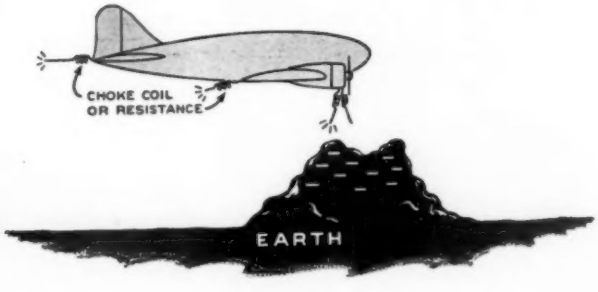


Figure 6

necessarily indicate that the propeller was developing its normal thrust, or that the plane was maintaining the required air speed to keep it in the air as it neared the top of a hill.

While the above explanation seems logical enough, evidently all charged planes passing over hills do not crash, and the explanation of crashes was not yet complete. It seemed necessary to investigate the relation of corona to engine power. What effect could ionized air caused by corona have on carbureter action?

One function of the carbureter is to receive gasoline and air and mix vaporized gasoline with the air in such proportions that maximum explosive power is obtained in the engine cylinders. If the gasoline does not properly vaporize, as on a cold morning, or if sufficient vapor is not admitted to the mixing throat of the carbureter, as when the adjustment is set for a thin mixture, then the power falls off and the engine slows down or stops altogether.

Perhaps, the ionized air drawn into the carbureter decreased the vaporization of the fuel, giving a lean mixture with a resulting loss of power when corona increases due to shift in the location of the static charge when the aircraft approaches an elevation.

Study of the effect of charged particles, or ions formed in various ways brought out some exceedingly interesting information.

1. Fog has been cleared by dropping charged sand from an airplane.

2. In England, fog has been dissipated by drawing a rack of high tension wires through the fog.

3. Cosmic rays passing through a chamber of quickly expanded air coagulates the moisture into fog. Photographs of the track of an ion, are pictures of the fog track caused by the passage of the ion through the cloud chamber.

4. In "The Conduction of Electricity through Gasses" by J. J. Thompson, experiments are described proving that an invisible steam jet is changed to droplets when connected to the terminal of a static machine, and that steam passing through a tube can be changed into droplets from invisible vapor by placing the terminals of a spark-coil in operation in the tube, even though no spark is passing and the terminals are covered with filter paper.

If ions fog the mixture in the carbureter, then an increased corona should lean the mixture. Corona about the motors increases as the plane nears an elevation providing the charge on the plane is great enough. The effect of leaning the mixture on motor power is related to the mixture ratio.

Aircraft engines operate between 80 percent and 120 percent of a normal mixture. Evidently, a slight leaning of a rich mixture would not reduce it below the required percentage, while leaning of an already lean mixture would reduce it below the percentage required for engine operation.

Ions drawn into the carbureter would therefore not affect engine equally if the mixture ratio was different. A pilot coming down from a high altitude, with the carbureter set for a lean mix, might have his engines lose power as he passed over an elevation, if he had neglected to increase the mixture ratio.

The information accumulated was checked against crash reports. Planes had crashed on one wingtip during fog, motors had backfired and stopped in snow storms, pilots had reported poor radio reception prior to a crash and wrecks were found off the radio beam.

To the writer, the evidence indicated that many crashes were due to static affecting the radio apparatus on the plane, or by causing its motors to lose power.

Motors can be protected from the effect of static by preventing ions from entering the carbureter. This can be done by filtering the air intake through glass wool or other suitable material, or by extending the intake opening to some point where ions are not numerous. Due to the ions present around mountain tops, caused by the leakage of electricity from the mountain, it may not always be possible to find such a location. Also the ions may be removed from the intake air by passing it between charged plates of opposite sign.

Zowie! Was that a close shave? The next time that guy clips me on a pylon I'll file a protest.

It is desirable to reduce the corona about the motors and this can be done by allowing the charge on the plane to leak off over a properly placed discharge system of points and wires. As the charge is shifted to the lower front of the plane, on its approach to an elevation, arrangements must be made to discharge the static at this location as well as at the rear of the fuselage and along the trailing edges of the wings. Care should be taken to keep such discharge away from the carbureter intake.

This discharge system will also eliminate the sharp corona which takes place about the plane, especially where the radius is small and which occurs when the static charge accumulates enough to raise the voltage to the breakdown point. Not only does the strong corona from the edges send out radio waves, but high frequency waves are set up in the metal of the plane.

When the static charge is eliminated over predetermined paths, such as trailing wires, it becomes possible to reduce the discharge from each wire so that its effect on the radio is reduced. It is also possible to insert in the circuit, at some point along the wire, the usual devices for suppressing the high frequency oscilations set in action by the corona.

High resistances, such as are inserted in auto ignition wires to damp out high frequence interference with the cars radio, or low resistance high impedence choke coils may be used for this purpose. Choke coils are probably best, as they permit a greater discharge of static.

Receiving loops on the nose of the plane will be exposed to greater corona as the plane approaches an elevation as the charge will leak off the shielding tube where it is cut to expose the coil. It would seem advisable to have a second receiving loop located near the rear of the plane, to be switched into the circuit when corona is bad near the nose of the plane (Fig. 6).

The use of static discharge wires has been recommended to students in the Crane-Tech Aeronautical Laboratory for a number of years. Beginning in January, 1937, the writer began sending letters and telegrams to the Bureau of Air Commerce, Universities, airlines, and aircraft factories, stating that a static discharge system be adopted.

As experience develops more effective ways of adjusting the static discharge system, the effects of static on motors and radio receivers will be eliminated, and air transportation made safer.

In addition to the static charges caused by the friction of the plane in passing through the air, are the initial atmospheric charges always existent at high altitudes which affect the total potential. Under certain conditions and at certain points on the surface of the plane, these charges may be additive and thus increase the relative earth potential, while under other conditions they may neutralize or even reverse the surface charges.

Still another condition affecting the distribution of the electrical charges on the plane, and further adversely influencing the electrical character of the air entering the carbureter are the highly ionized mists and fogs that sometimes cling closely to the peaks in the form of a dense blanket. All of these conditions augment the effects already described and demand close study.

Even those who do not actively fly show an interest. The local Lions' club put up these signs.

"The Butcher, The Baker..."

by FRANK LOVELL

This is the story of one air-minded community that flies for the sheer pleasure of it.

Dr. D. E. Dorchester plans to commute by air to the Mayo brothers' clinic.

Lyman Houfek, resort employe, is a crack golfer but prefers aviation.

Jack Draeb is a jeweler, flew years ago, decided recently to start again.

IN DOOR county, Wisconsin, the butcher, the baker and the candlestick maker take to the air just as naturally as a duck takes to water.

There aren't any softies among the responsible business and professional men of Sturgeon Bay and other peninsula cities; they've gone into aviation in a big way and for keeps. Today they are poring over plans for private hangars, ramps and seaplane bases preparatory to cluttering up the sky with winged contraptions of every orthodox variety.

Consider, for instance, the case of Karl Reynolds, king of the cherry growers and secretary of the Wisconsin State Association of Commerce: By rail, by fast auto and by airliner or chartered plane, Karl flits all over the state and nation on business errands. Experience convinced him that the airplane was the fastest, most efficient and, in the long run, the most economical mode of transportation. So he induced Ed Hedeen, a Racine pilot who has been flying ever since World war days, to establish an airport at Sturgeon Bay. In a short time Reynolds learned to fly.

Dr. D. E. Dorchester, surgeon and physician who maintains a hospital in Sturgeon Bay, was favorably impressed with the cherry king's idea. So he, too, enrolled in Hedeen's school. Today Dr. Dorchester is a competent amateur pilot with 60 solo hours to his credit. As soon as he obtains his pilot's license, Dr. Dorchester intends to purchase a plane in which he proposes to make frequent hops to the Mayo clinic at Rochester, Minn.

(*Concluded on page 70*)

Sturgeon Bay lassies also have taken to aviation and prove able students.

Ed Allee is a commercial fisherman, can swim Sturgeon Bay with tied hands.

Airman Ed Hedeen "mothers" the flying townsfolk, lays stress on safety.

Dr. H. G. Grovogel, a local dentist, soloed last spring, has his license.

TEST

When the Army finally buys an airplane, rest assured that that ship can do practically anything in the air. The Air Corps test pilots prove that.

SUSPENDED 5,000 feet in the air with a torn parachute and more broken threads than he could count —or care to think about!

Captain Frank Irvin, test pilot with the flying branch of the United States Army Air Corps, Wright Field, looked aloft at the great silk umbrella above him, let slip a few choice expletives from the standard airman's vocabulary, then looked down.

Below was the tiny crossroads village of Medway, hardly out of take-off range from Wright and Patterson fields. And above, of course, the damaged 'chute. Off someplace in the ether a new P-26 was hurtling into space until inexorable gravity pulled it to the ground.

When Captain Irvin jumped, his airspeed indicator showed 330 m.p.h. The ship had been in a steep dive. The pilot had set a record—nobody had ever jumped from a plane traveling that fast before. But "records" were now the very least thought of the dangler. Business at hand was to get down—alive if possible—with a torn 'chute.

But he made it. The remaining shrouds held fast. Each of the two dozen support cords, with an individual tensile strength of 100 pounds, held. The 'chute flipped and fluttered; the air streamed through the torn places—but Irvin got down with only a few wrenched ligaments and body bruises to plague him.

Purpose of the flight that day had been to test thoroughly this fine new ship. Thrown into a power dive at 12,000 feet, it had failed to emerge at the 7,000-foot level where Irvin pulled back hard on his stick. At 5,500 feet, he knew he had to jump—and did so.

But although it was all part of the routine work of test pilots attached to the Army's flying branch, all authorities concerned, including the pilot himself, would have been vastly disappointed if some good had not resulted from the mishap. And good did result. Scientifically, results were tabulated from the jump and its effect which resulted in new parachute specifications insuring safety in jumping from planes traveling at excessive velocities.

Professional test pilots—Army, Navy and civilian—are the most versatile and hardy in the business of flying. They must master strange planes under any and all conditions and with every attendant risk that an untried and unproved machine may engender. For a complete insight into the present day picture of test flying, let's start at the beginning.

In general, Army methods of trying out ships before purchase call for such high and rigorous standards that they may be used for study purposes without slighting anyone. The story begins with the procurement of airplanes.

The Army needs a special type ship. Funds have been provided by the government. Engineers at Wright Field designate the characteristics, specifications, standards, performance, etc., that are desired, then send these out to manufacturers for bids. They may want a ship with a 35,000-foot ceiling, able to clear a 50-foot obstacle in 800 feet, armament of two .50 calibre machine guns, capability of carrying 1,000 pounds of bombs, a cruising speed of 265 m.p.h., and gas capacity for 800 miles; or almost any combination of characteristics.

Bids are opened in the presence of company and Army representatives, and are then published. The Army may be seeking one plane, five, 10, 50 or 500

Major S. M. Umstead (left) is present chief of the Army's test pilots. The others above are Lt. E. H. Barksdale, Maj. St. Clair Streett and Capt. H. R. Harris, first Army Caterpillar.

PILOT

by JAMES FARBER

Maj. Hez McClellan was killed in the crash of the first Flying Fortress.

planes, but the process is the same.

When the successful bidders bring in their ships, the flying branch is ready to enter the picture. Its members will be charged with the responsibility of testing these planes for reports on how they meet the requirements.

Through this highly practical "laboratory" test each plane is rated. If there is a failure in the first test, a second is made, even a third, to check and recheck. Oddly enough, though, if a plane meets the requirements exactly with nothing to spare, it will not be selected. Grading is done on a point system that is based on "excess" performance and qualifications, and not precise meeting of requirements alone. These "requirements" are, in effect, a minimum.

The rules for these evaluations are quite simple but not always easy for the manufacturer to meet. The process of grading is done on a point system: a ship can be awarded a full 1,000 points. Of this, 350 are reserved for the judgment of the board of officers who will make the final decision. Of the remaining points, 50 may be awarded for complying with armament specifications; 100 may be given for altitude climbing performance; 200 may be awarded for some other feature. Grading is according to the special qualities sought in types of ships.

Remember, the contractor has guaranteed his product. What, then, if during these official tests and checks, it fails to click? The answer is the usual one, whether applied by the military or by a commercial outfit. Penalty. Suppose, for instance, that the plane has been guaranteed to do 330 m.p.h., but is only able to do 320. The Army is privileged to penalize (for example) the company $10,000 for each mile under the 330 guarantee. Or, it may penalize the company $100 per mile under this standard for each plane delivered to the Air Corps. Decision in such matters rests with the board of officers charged with the final decision on the contractor's product.

Here are some of the exhaustive tests through which planes are paced: cooling, climbing, takeoff and landing characteristics, carbon monoxide outlets (to insure complete throw-off of CO lest pilots and passengers be asphyxiated), power calibration (to determine high speeds over fixed courses), sawtooth climbing and the usual series of acrobatics. The climbing tests are highly important for military airplanes and are carefully accomplished at altitudes varying from 25,000 feet on up to the ship's ceiling.

The pilot, after he has made these rigorous tests, makes his final report which contains the results of his checking together with his observations and opinions.

The flying branch at Wright Field, now headed by Major Stanley M. Umstead, includes several functions in its routine: the operations division (for the entire field), meteorological flights, and maintenance of planes and engines. The fourth function, test flying, is by far the most important.

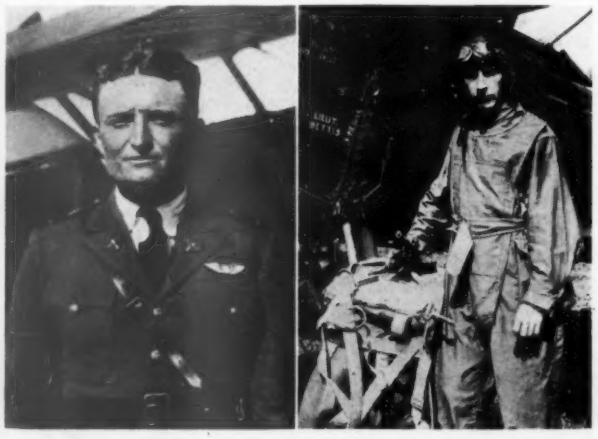
It takes a certain temperament as well as talent to make a good test pilot. He is usually selected by reputation or through his willingness to engage in this hazardous work. Some pilots want a great variety of experience. One of them said:

"I got into the work because there was something new all the time and I liked the idea. I still like it and would rather do this work than anything else."

The hardbitten test flyer deprecates the dangers. He knows what may happen in many cases but in the vast majority, he hasn't any assurance at all that the most commonplace mishap, accident or performance failure will not end in sudden death. Still, he flies on, happy in his work, confident that man is, in the last analysis, going to be the master of the air.

It is by no means a happy-go-lucky attitude. Back of the test pilot is not only a wealth of experience which tempers his mind to meet almost every conceivable kind of emergency, but a technical training as well that has produced a mind that takes keen pride in his part in the profession. That mind regards things from the trained heights of education in all the scientific branches of learning. It knows all the tricks.

Captain Irvin's experience with the torn parachute is only one of the gamut of experiences, hair-raising and other-



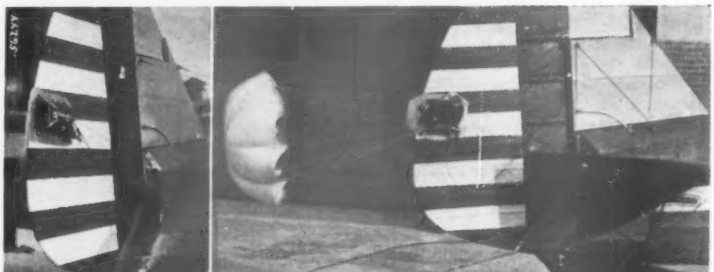
Lt. Irvin A. Woodring (left) was killed while testing a fighter. Lt. C. K. Bettis (right) was killed in 1926.

These are the test pilots now on duty with Wright Field's testing division.

wise, that are familiar to all test pilots. And, in common with this particular episode, the others are usually something new which require brass-lined nerve directed to meet something that may not ever have happened to anybody anywhere.

Pilots still have trouble with landing gear of the retractable type despite all the progress made toward their ultimate perfection. Damaged or stubborn landing gear today does not present the problem that it used to, and this encouraging fact may be largely accredited to experimental flying.

Two pilots had been putting a $300,000 amphibian through its paces on a two-hour fuel consumption test. Ready to land at Wright Field, the officers discovered that the landing wheels could not be lowered. They circled the field vainly trying to make this last preparation for landing. But it was no go. The diabolical conspiracy of inanimate objects (as someone has aptly put it) was hard at work.



This special parachute was designed to pull the ship out of a flat spin. The 'chute lowers the ship's nose so the pilot can get control.

The pilots wrote a note and dropped it on the field. It read: "Our wheels are stuck in upward position. We have enough gas for Selfridge (Field). If you want us to land at Buckeye Lake, have one man in compass platform; if at Indian Lake, two men; and if at Selfridge, three men. Love and Kisses".

Instructions were accordingly provided to land at Selfridge, 250 miles away. The point is that these two pilots could have made a belly-landing with considerable safety to themselves, but chose the inconvenience involved in missing an evening at home with their families to prevent damage to $300,000 worth of equipment:

A test pilot's responsibility is limited in the case of a plane not owned by the government. On another occasion, the hydraulic fluid line broke on a ship featuring a retractable landing gear. The pilot could have jumped when he ascertained that the dangerous business of landing on one wheel was involved. He elected to stick with his ship, however, and brought it down with only minor damage.

But landing gears are only part of the story. So many other things can and do go wrong that, as we said before, a pilot never knows what it may be next. As for instance:

During three months of patient work on a certain plane equipped with a certain type of motor, the test pilots had plenty of engine trouble. No less than 12 engines burned out, with forced landings the order of the day. The trouble was finally overcome after the varying combinations of scored rings and inadequate oil circulation and pressure were corrected.

On another occasion, a pilot took up a ship equipped with skis through which wheels had been built. The skis broke from the force of pulling out of a dive at 325 m.p.h. There was only one thing indicated for the pilot: to jump. He did.

Captain Sam Harris, who could tell you plenty about landing gear trouble, took off in a pursuit plane with a canopy over the cockpit. The canopy was insecurely fastened and the wind pressure caused it to collapse. Harris was struck on the head but landed the ship despite his semi-conscious condition. The result of this experience, which might so easily have been fatal (and from such a comparatively unmilitary and un-aeronautical cause) was the general strengthening of such canopies so that now there is no danger at all of a recurrence of the hazard.

Two years ago the pride of the Army, a gigantic bomber, fell to the earth from a few feet and burned away two lives and $400,000 worth of property. Subsequent investigation revealed a failure to unlock a surface control lock prior to the takeoff. The result of the catastrophe with its appalling loss was the improvement of control locks. This kind of accident can't happen again. But it cost two lives to save many future ones.

Tail 'chutes as safety devices, to say nothing of 'chutes capable of lowering the plane itself, form one of the most interesting problems—and series of experiments—that absorb aeronautical science today.

Most of these experiments are the result of the unceasing work to take the danger out of spinning tests. Activity toward developing efficient tail 'chutes was spurred in the vast experimental laboratories at Wright Field when one old-time pilot lost his life nearly two years ago in a plane which failed to recover from a spin. The Army renewed its efforts to master spinning safety devices and inasmuch as the pilot had a tail 'chute on the plane that carried him to his death, interest in overcoming spins through this device has been intense. Results, as yet, are inconclusive, but the Army has great hopes.

(*Concluded on Page* 85)

The pilot of this experimental fighter was flying tests when he jumped for his life.

Aline Rhonie is better known among airfolk as Pat Brooks.

Ghosts Walk At Roosevelt Field

by MILTON V. O'CONNELL

It is fitting that so able an airwoman-artist as Aline Rhonie should execute this outstanding historical aeronautical mural.

SHADES of men who once flew the skies in bamboo and cloth contraptions, strapped to a small pilot's seat with the "pusher" prop whirring behind their ears, must pass through Hangar F at Roosevelt Field these nights.

Feather boa-ed ladies with bustles and pompadours and grey-helmeted policemen are in the ghost parade, for they also are of the era of "early bird" aviation on Long Island, which is growing in pictorial form on the walls of the famous hangar.

It is Aline Rhonie's mural panorama of the beginning of American flying that inspires these ghosts to walk in the hangar from whence many air immortals trundled various types of planes out unto the field for their conquest of the upper regions.

And, in contrast to some of the aircraft and noted flyers, she is depicting in her murals, the young lady—who is still in her twenties (in fact was born the year the first hangar was built at Roosevelt)—climbs into her fast cabin plane at the end of a day's work and roars away at a speed which would have amazed some of those early birds on the mural-covered walls.

The faces of the Wright brothers, of LeBlanc and his Bleriot, Santos Dumont's *Demoiselle*, Glenn Curtiss, Lincoln Beachey, Count deLesseps, Claude Graham-White, Sopwith, Arch Hoxsey, Eleanor Sears, Vincent Astor, and a host of others are included among the 500 or more portraits and 100 types of planes which constitute the panorama of early flying in this country. Many of those depicted have made their Last Hop, while others are still actively engaged in aviation, under circumstances tremendously different from the days of the old pushers.

The murals will form a 110-foot background for the national air shrine which Air Service Post 501 of the American Legion has planned for the famous hangar. The painting will take at least another year to finish, being about one-third completed now.

Every day, in her studios, Miss Rhonie (known to the flying fraternity as "Pat" Brooks, wife of Reginald Langhorn "Pete" Brooks) is working on new portraits which when completed in sketch form, are to be transferred to the walls of the hangar in their proper position.

Due to space limitations, this pictorial history of American aviation will terminate with the year 1926, so that the many trans-oceanic hops

(*Continued on Page 72*)

Above and below are three finished sections of Mrs. Brooks' mural. Note the date under each wall section.

Unlike the Wrights and Curtiss, W. Starling Burgess is comparatively unknown in present-day aviation circles. Nonetheless, the story of Burgess is a true saga of American pioneering.

This Burgess tractor biplane was ultramodern back in 1912.

THE STORY

ALTHOUGH it has been many years since the last Burgess plane left the production line, the Burgess name, as any of the old timers will readily tell you, was at one time one of the best known in America for these planes helped to make early aviation history in this country.

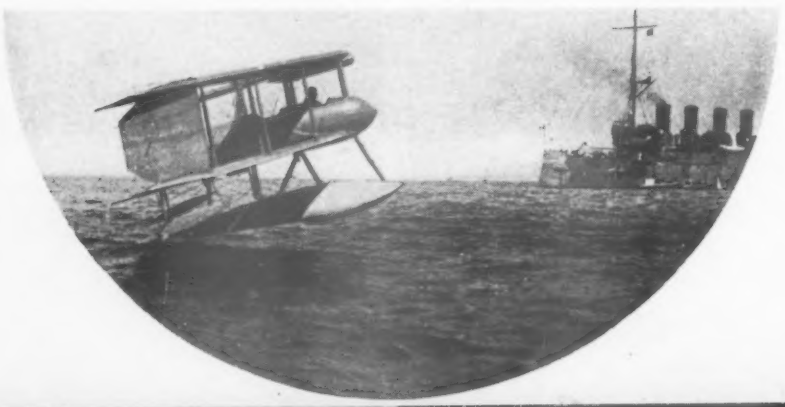
The story of these old Burgess ships begins back in 1909 when W. Starling Burgess, well known designer of racing yachts (his *Enterprise* won the 1930 International Cup Race from Lipton's *Shamrock V*, and he also designed the *Rainbow* which in 1934 claimed the "old mug" in competition with T. O. M. Sopwith's *Endeavor*. He was co-designer of the *Ranger* which this year retained the cup in races with Sopwith's *Endeavor II*) began to take an active interest in the then new science of aviation.

It was only natural that the first craft which this yacht designer produced should be a seaplane. This machine was an open work pusher biplane type powered with a four-cylinder 30 h.p. "kicker". The craft had outriggers in front and behind on which were attached forward and rear elevators and a rear rudder. Lateral stability was taken care of by a number of vertical triangular fins which projected above the top wing. The theory of this fin arrangement was that any lateral gusts of wind would act upon the side area of the fins and since they were above the center of gravity of the machine, the effects of these gusts on the wings and main structure would be greatly neutralized, thus minimizing the tendency to capsize. This first Burgess plane was mounted on twin floats and it proved so successful during its first flights that a number of planes of the same type were put into production during 1910.

A firm known as the Burgess Company was organized to manufacture these planes and in addition to this standard model, experimental ships were built for a number of famous pioneer flyers, including Sopwith and Claude Grahame-White. Grahame-White was so impressed with the maneuverability of his Burgess that he ordered several machines built for use at his flying school in England.

Shortly after this, Burgess made arrangements with the Wrights to build planes under the Wright patents and soon Wright-Burgess ships were in production, with many different types being brought out in rapid succession. One of the most interesting of these was the Model F. This craft was a modification of the famous old Wright Model B and

An outgrowth of some of the earliest Burgess experiments was this successful seaplane, vintage of 1910. Note the pilot's helmet and the props.



Of all Burgess developments, the Burgess-Dunne seaplane (left) probably is best remembered. This ship was one of the world's first flying wings.

by ROBERT H. RANKIN

Surprisingly modern for its day was this Burgess trainer.

Y OF BURGESS

it was used extensively for the training of many military and civilian pilots. The Model F was a two-seater pusher biplane powered with a four-cylinder water-cooled engine. The front elevator so common in the Wright design was eliminated in the Burgess modification and the rudder and elevators were placed to the rear of the main planes.

Because his machines were being used with so much success as training planes, Burgess in 1911 opened his own flying school and placed that well-known pioneer, Harry Atwood, in charge of it. This school was an outstanding success and connected with it either as pilots, demonstrators, or students, were such famous flyers as Norman Prince, Sopwith, Charles Hamilton, Phillips Page, Cliff Webster, Walter Brookins, and Grahame-White.

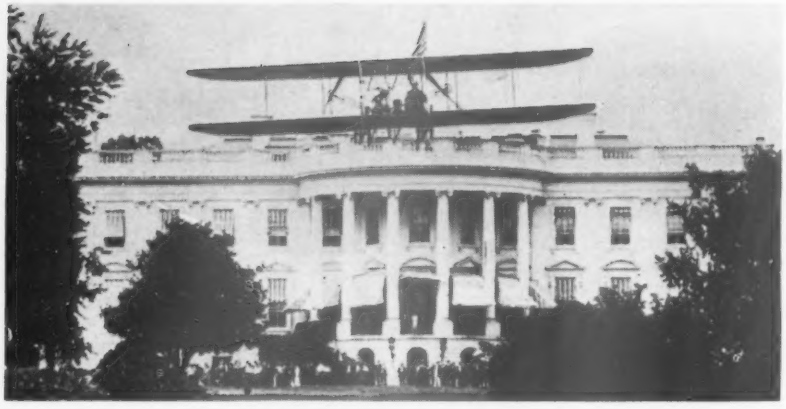
During all this time the Burgess organization was interested in over-water flying and extensive experiments were conducted with pontoon and float designs. The first result of this experimentation was the adapting of a standard Model F as a twin-float seaplane. The production of this craft opened a new field to the concern and Burgess "hydros" became popular at once, with ships being built for such well-known pilot-owners as Robert J. Collier and W. E. Scripps.

By 1912 aviation had become quite popular in this country and "flying meets" were quite the order of the day. At this time the Gordon-Bennett Cup Race was the one *great* event in aviation circles and the best craft available competed for the award. For the 1912 edition of this famous racing classic, Norman Price—who was later to gain fame during the World War as organizer of the Lafayette Escadrille—had Burgess build a special single-seat racing job. This small mid-wing monoplane was powered with a Gnome 140 h.p. rotary engine and it was fitted with small twin rudders. The racer was fitted with a sturdy landing gear and the rather thin wings were supported by much external bracing. Looking quite similar to the Nieuport monoplanes of the day, the craft was fairly well streamlined and it was clocked at 120 m.p.h. during its trials. It must be admitted that this was a fast clip for the year of 1912. The machine for some reason was not entered in the Gordon-Bennett contest and Burgess did not again enter the field.

During the summer of this same year, the *Scientific American* offered a prize for the development of a successful twin-engine airplane. In order to win the prize, it was specified that the machine must be

Mr. Burgess' particular forte was in the building of aircraft for over-water operations. His Model K flying boat (above) was a success in its day.

When the Wrights and Burgess got together in 1914, the Burgess-Wright Model F (right) was the result. Note the ship's chain-driven propellers.



A favorite place for aviation's pioneers to demonstrate their wares was on the grounds of the White House. A Burgess-Wright pusher is shown in flight (above).

able to fly on either motor alone. Immediately upon announcement of this prize offer, Burgess set about to build such a plane. This machine was a standard Model F with a motor mounted on either side of a fuselage. Through a chain drive, these motors were connected to two pairs of propellers—one pair mounted as pushers and the other pair fitted as tractors. These propellers were driven in opposite directions—so as to counteract any gyroscopic tendencies. Friction clutches were interposed between each motor and its propellers, thus making it possible to couple the motors together. This machine was successful in all flying tests and it was probably the first twin-engined job ever built in this country. The progenitor of the later Handley-Pages and Caudrons, this Burgess success was not awarded the prize because no other planes had been built to compete for it.

During this time, Burgess was experimenting with enclosed fuselages. He realized that if high speeds were to be reality, pilot and engine would have to be completely out of the air stream. As a result of his experimentation, the Model H was brought out. A tractor biplane of equal span, it was powered with a 70 h.p. eight-cylinder air-cooled Renault motor and it may be considered as the father of the modern military tractor. This Burgess production had a high speed of around 70 m.p.h. and it created something of a sensation when it was exhibited at the first Aero Show in New York City. Incidentally, this particular Burgess was probably the first enclosed fuselage type adopted by either the Army or the Navy.

After being thoroughly tested by Army pilots, this Burgess type was purchased as standard service equipment for the U. S. Signal Corps and with the outbreak of trouble on the Mexican border in 1914, repeated orders were given Burgess for this tractor. It was at this time that the Burgess Company broke all existing aircraft production records by completing the first three machines within 24 hours after the government order had been received.

Burgess now entered the flying boat field with the construction of boats known as Models K, H, and I. These unequal span biplane pusher boats were outstanding in that steel tube girders were used in place of wood in the wing structures. Another interesting feature was the arrangement of the top wing which was mounted so as to rotate about a fixed girder. This girder was fitted at approximately the center of pressure on the wing, thus balancing all air forces. This allowed wing warping with a minimum of effort.

The Model K boat passed all government tests and was ordered in quantity by the Navy Department. Models H and I were of the same general design as the Model K, differing mainly in that they were fitted with engines of different horsepower. The Model I, built under contract for Robert J. Collier, was pow-

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Below is a close-up view of the Burgess-Dunne seaplane similar to that shown on page 50. Note the location of the control surfaces on this flying wing.

Swiss Air Watches

THE Swiss watch industry has been of world renown for centuries. It occupies a leading position as far as precision workmanship is concerned.

In watch manufacturing centers it is often said that the finest precision machinery and skillful hands alone would not be sufficient, heredity has a good deal to do with it. There may be something in this saying, for in the Jura mountains there are many thousands of families whose ancestors have been in the watch industry for half a dozen centuries.

The latter industry may be regarded as the backbone of the Swiss precision industry, which, among other things has for years included highly sensitive electrical apparatus and instruments, machines for fine mechanics, etc.

When aviation had gone beyond the experimental stage, when it was no longer a question of flying, but of flying regularly and safely, it was but natural that the Swiss precision industry should have turned towards the construction of precision instruments for aircraft.

Owing to the above-mentioned reasons it offered the best possible conditions for the development of this new industrial branch, which requires high quality products. The reliability of the instruments is both for pilot and passenger an essential factor for safety.

It was therefore not surprising that Swiss watches were soon to be found on the instrument boards of aircraft. One must not assume, however, that an ordinary watch with spring attachments was ready to be used for aircraft.

When one considers that a plane may be exposed within a comparatively very short time to changes of temperature ranging from plus 33 to minus 10 degrees (or even greater extremes) one realizes that new demands are being made on the watch industry to bring out a watch which, even under such severe working conditions, will invariably keep the greatest accuracy. It has been possible, however, to manufacture watches suited to such conditions.

Swiss aircraft watches have been for a long time a highly valued export article. For example, all the planes of the Balbo squadron which took part in the famous Rome-Brazil flight, were equipped with Swiss watches, chronometers and chronographs with following hands. These chronographs have two hands which revolve simultaneously, one on top of the other; by pressing a small button one of the hands can be stopped so that the exact time may be ascertained.

By pressing another button this hand catches up with the other which has not stopped revolving. For the second flight of the squadron from Rome to Chicago in 1933, each plane was equipped with two chronometers to give the total number of hours.

(*Concluded on page 96*)

Commuting to New Yorks'

This is Franz Schneider, prominent businessman, leaving for his office.

THERE'S no more of this dashing madly for the 8:48 for New York's Banker Jones or Broker Smith. As this page clearly shows, the august gentlemen of Wall Street have finally thrown off the oppressive yoke of train-catching and have taken to operating their own transportation systems between home and office. If it wasn't that Banker Jones had the right idea in setting up this little system, these pictures probably never would have been made.

Of course, this method of commuting between your home out in the Bronx and your office on 42nd street is likely to be, shall we say, a little inconvenient to your pocketbook. But naturally, Banker Jones has no such worries. So every morning at just about that time, New York's Grand Canyon echoes to the roar of a sleek amphibian, flying boat or seaplane bringing The Boss down to his daily labors.

New York's Skyport boasts a lively amount of business on working days. Some plane-owners fly their own ships to work; other have their personal pilots. Just lounge back and read the paper while flying 45 miles to work in 22 minutes. Oh well, guess anything's better than the bus or street car.

Financier Henry S. Morgan arrives at the New York Skyport in his Grumman.

William C. Hunt flies the Morgan Grumman to Wall Street every morning.

An African Air Saga

by P. JAC STRYDOM

This interesting story from "down under" is about the pioneers in South Africa's aviation and a memorable flight to Capetown.

Sir Pierre van Ryneveld, famed South African pioneer, as he appears today.

THE names *Silver Queen* and *Voortrekker* probably do not convey much to the younger generation in other countries, yet in South Africa they stand for everything that the birth of aviation means. For they are the names of the airplanes that pioneered flying in the southern end of the African Continent.

The flying era in South Africa actually dawned in the year 1888, when John Weston, later Rear-Admiral Weston, commenced his spasmodic experiments that, in the early part of the present century led to a certain measure of success. He, however, had his real impetus in 1908 when the success of the intrepid Wright brothers had become an indisputable fact.

In the little town of Brandfort, John Weston erected a workshop and set to work on the construction of a flying machine, very similar to the early Wright biplane. Slowly but surely he perfected his craft until he was able to make several successful flights, and until 1913, he visited England several times in search, mainly, of a suitable engine for his airplane.

Prior to this, however, C. J. Bredell had in 1911 also built an airplane which he flew at Rosebank near Capetown, while on December 27 of that year, a small airmail service had actually been established between Kenilworth and Muizenberg in the Cape Province, by Mr. E. Driver. On February 8, 1912, he made an impressive flight at Johannesburg, covering a distance of 15 miles at a height of 1,300 feet.

In that year, too, a flying school was, through the instrumentality of Captain Patterson, established at Alexanderfontein, near Kimberley. But all activities had to cease with the outbreak of the Great War.

At last, the year 1919 dawned. The conflict in Europe had ceased, and civil aviation throughout the world was once more being developed with enormous strides.

1920—and the great pioneer flights were in progress. Let us look back and follow the flight that meant so much to South African aviation.

Early in the morning on February 4, 1920, a huge silver body left Mother Earth at Brooklands and soared into the blue sky. It was a Vickers *Vimy*, converted from a bomber into a civil airplane and dubbed the *Silver Queen*. She carried Lt. Col. H. A. van Ryneveld (now Sir Pierre) and Captain C. J. Q. Brand (now Sir Quintin).

Over France, the Alps and Italy soared the graceful craft. After a futile attempt to reach Foggia she had to turn back and land at Rome.

That night van Ryneveld and Brand flew over the Mediterranean—a flight that will ever remain in their memories as a horrible nightmare. Above the vast stretch of water they encountered a terrific headwind which blew them back for hours, but even with almost all odds against them they reached Northern Africa in safety.

Their success, however, was short-lived. In order to reach Capetown in the shortest possible time, they left Cairo at night. Shortly after taking off they discovered that a radiator tap had been opened and by the light of their torch they saw the last puffs of steam escaping.

The engine was overheated, and in the darkness, above unknown country, they had no alternative but to attempt a landing. The *Silver Queen* descended and struck a pile of boulders on the banks of the Nile at Korosko. She was completely shattered, but her engines were intact.

Provided with a new machine in which the old engines had been installed they managed to reach Bulawayo, but here

(*Concluded on Page* 94)

This De Havilland DH-9, known as the "Voortrekker", completed the memorable pioneering flight to Capetown, South Africa, arriving March 20, 1920.

This is the ill-fated "Silver Queen" before (left) and after (above). The Vickers "Vimy" met her end on a pile of boulders.

Streamline Your Airplane

by RAOUL J. HOFFMAN

When you know how, streamlining is an easy, efficient method of boosting your ship's performance. Mr. Hoffman's article this month simplifies it for you.

STREAMLINING or fairing is defined as ways and means of reducing parasite resistance of parts exposed to the flow of air. This reduction will naturally be effected by having the molecules of the air passing the object without changing their relative positions, without creating turbulency. This smooth flow of air may be accomplished by shaping the whole unit for minimum resistance, by adding material to form the best shape, by adding guide vanes, by reducing interference between parts, by concealing or retracting the unit within the structure without lowering the safety factor of the airplane.

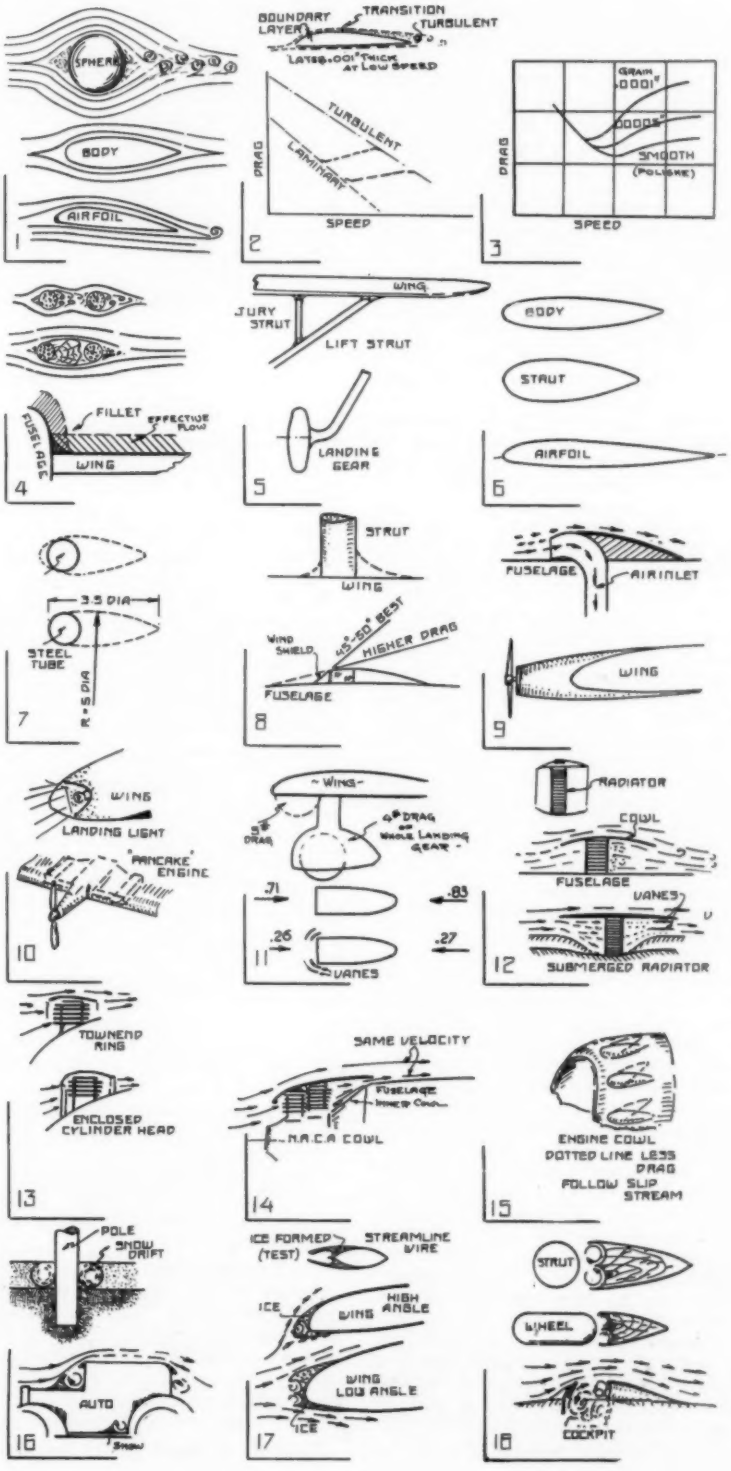
For the sake of simplicity, the air flow is assumed to be two-dimensional, though it is always three-dimensional. It may be undisturbed (laminary) or disturbed (turbulent) depending on the object and speed. Sec. 1 shows the air passing a sphere, a streamline body and an airfoil.

By closer investigation it is noticed that for a certain distance (Sec. 2) the air clings to the surface of the airfoil; this layer of still air, about 1/1000 of an inch thick at average speed, is called the boundary layer; at a point (the transition point) it breaks away from the surface and becomes turbulent.

Both airflows, the laminary and the turbulent, are a function of size and speed. The surface texture will affect the resistance only if the grain of the finish is larger than the thickness of the boundary layer. The diagram in Sec. 3 shows that at low speed the resistance is the same, but that at high speed the difference is so great that only a high polished surface will give satisfactory results.

From this may be deducted that all entering sections (nose) of an aerodynamic unit shall be made as smooth as possible so as to have the turbulency delayed as far as practical, for the closer the transition point is to the trailing edge the lower will be the drag.

Turbulency may be decreased or increased by placing two objects close to each other by the effect called "interference". Two wires or cables placed one after another reduce the total resistance; filling the space (Sec. 4) with a wood strip, the resistance is reduced to 1/3 of the resistance of a single wire. The wing-fuselage interference may be explained by the interference of the effective air flows; a small fillet will reduce the created turbulency. The interference of the lift strut is kept low by having the width of the strut smaller than the distance to the surface of the wing; very often a braced narrow strut, a jury strut must be used to conform to this design; the same basic idea is



employed in the construction of the cantilever landing gear shown in Sec. 5.

Section 6 shows the general outlines of a streamline body, of a strut and of an airfoil. The airfoil is of interest, for the distance over the upper surface is nearly the same as past the lower surface. Thus both airstreams will meet at the same instant causing a minimum of turbulency.

Different drag values are obtained for open air tests and wind tunnel tests having the same relative air speed. This phenomenon is explained by the different drag values of the laminary and of the turbulent flow, for the wind tunnel has always a certain turbulent flow. The difference will be nearly 30 percent if the medium is water.

Streamline struts are not always obtainable. In that case, fairing a round tube with balsa wood (or sheet metal) will be an effective substitute. Good streamlining reduces the resistance to 1/20 of the unfaired tubing. Fig. 7 shows a theoretical double fairing and a practical, single fairing with an outline formed by circular arcs. Sec. 8 shows the streamlining of a strut at the point of attachment and the correct slope of a windshield of a cabin. Sec. 9 shows the streamlining of the carburetor air intake especially important on high speed airplanes. Streamlining of large engines is not such a grave problem when the thickness of the wing is nearly the same (Sec. 9) as the diameter of the engine.

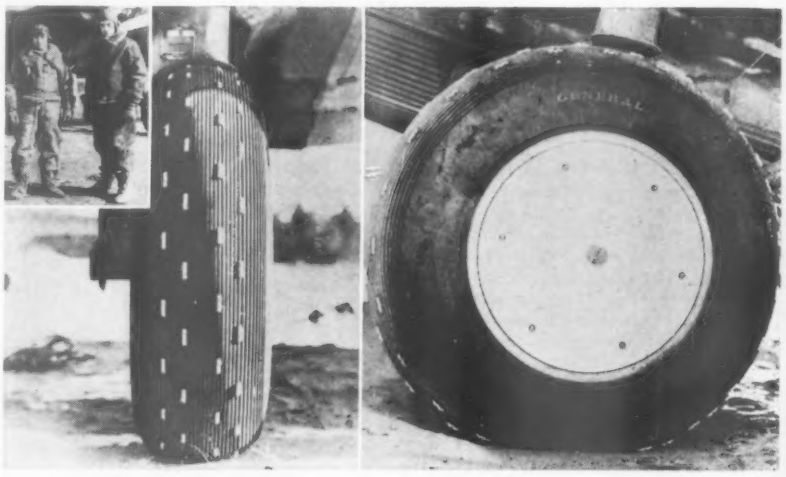
Another method to reduce the resistance is to conceal the unit within the structure; placing the landing lights (Sec. 10) inside the wing; confining the loop antenna within the fuselage; designing "pancake" engines to fit inside the wing; and eliminating all outside supporting elements by making the airplane a cantilever construction.

Retracting is necessary with the landing gear, tail skid control surfaces or part of the wing in order to eliminate such resistances. The retraction of a landing gear must be complete, for a 50 percent projected wheel (Sec. 11) at a certain point of the wing has a higher drag than the whole cantilever landing gear for a low-wing airplane.

A very interesting method of reducing resistance is the adding of vanes to guide the airflow, to confine the turbulent air within the structure and to conduct the air smoothly to the outside. The influence of vanes on the resistance of a body is shown in Sec. 11, giving the drag coefficient for each case. Streamlining radiators lately has become a very interesting problem, for liquid cooled engines have shown good performances. Enclosing an open radiator into a streamline casing will reduce the drag by 50 percent of its original value. Further improvement would be to place the radiator close to a body and then streamline it. A final improvement would be to submerge the radiator so that the outside cowl will be parallel with the body; the area of the frontal and rear opening of a size to give an airflow equal to the outside airflow and sufficiently large to cool the engine. The three main

(*Concluded on page 74*)

New Winter Tire Developed



Two views of the new cleated tire that has been delivered to the Army Air Corps for tests. The two Air Corpsmen (upper left) flew tests recently in a bomber.

FOR many years, the Army Air Corps has experienced a great deal of difficulty with landing gears for winter operations. Though the conventional wheel has been unsuccessful in ice and snow, the skiis which replaced them have not been the solution they were expected to be.

In much of its winter flying, the Air Corps has used frozen lakes for its landing fields. Where the skiis worked on deep snow, both they and the conventional airplane wheel proved tricky propositions on the sleek icy surface of a frozen lake. Skids were common and, once started, an airplane was liable to go cartwheeling down the lake with its helpless pilot praying that the ship's high landing speed would lower to the point of control before running off the lake out of control.

The new tire shown above may or may not be the answer to this problem. The manufacturer has anchored grooved metal cleats over the entire face of the tire which alter the original tire's effectiveness very little, but give a great deal more traction on ice. Tests have been flown on this tire, mounted on a Martin bomber for that purpose. Success has been reported.

Announce International Air Show

PLANS are shaping rapidly for the International Air Show to be held at the International Amphitheatre, Chicago, January 28 to February 6.

Indications are that at least 75 planes will be exhibited in the arena and exhibition halls of the big building. In addition to the showing of the latest airplane models, the Air Transport Association of the federal government will have exhibits in the show. A feature of the Chicago show will be the fact that planes to be exhibited can be landed on a field adjacent to the exposition building. The Department of Commerce has approved and licensed a landing field in the huge paved parking lot adjoining the amphitheatre. The field will have a runway 1,760 feet long and over 200 feet wide.

The airplane manufacturers will exhibit all types of ships from the smallest to the biggest models. The Air Transport Association will have a modern Douglas sleeper plane in the arena. Government participation will include ships from the Army and Navy and the educational exhibits of the Bureau of Air Commerce.

The Chicago Show will be the only national show for 1938 approved by the Aeronautical Chamber of Commerce of the United States. C. R. Walgreen, head of the national drug chain and himself an enthusiastic plane owner, is chairman of the board of directors of the show. Jack Vilas, veteran flyer and long a prominent figure in the industry, is president.

Special efforts are being made to make Air Show Week in Chicago a gathering for the leading organizations in the whole field of aviation. Perhaps the most important of these will be the gathering of the fixed base operators. With the approval of the executives of the show, invitations have gone out to 3,000 fixed base operators from Rel K. Branch of Grand Rapids, Mich., chairman of the aeronautics legislation committee of the United States Junior Association of Commerce, to visit the show and meet for a discussion of their mutual problems. This meeting is expected to bring about closer cooperation between the manufacturer and the men who are the backbone of the private aviation industry.

POPULAR AVIATION was among the first members of the aviation industry to contract for an exhibit at the coming show.

Down at Randolph and Kelly it's a perpetual friendly row between attackers (left) and "peashooters" (right). The peashooter here is the author, Cadet Hays.

Cadet Days at Randolph Field

by MacDONALD H. HAYS

THE thing everybody is afraid of in formation flying is running into the leader's plane. This never happens. At least it hasn't happened very recently, and I don't think it will. You see, being nervous, the beginner allows a safe distance to begin with, ten feet more for extra safety, ten feet because he is a beginner, and ten more feet because he feels kind of nervous about the whole thing anyhow.

The result is that you moon vaguely about within a quarter of a mile of the leader's plane, or perhaps get close enough to read the large numbers which are painted on the side of his fuselage. For straight and level flying this works out quite well, but if the leader turns, and you are flying the outside wing position you are hopelessly lost unless you fly about 203 m.p.h. The maximum speed of a BT-9 is 140.

As the student gains confidence he gradually comes in closer and when in the correct position with the nose of his plane slightly ahead of the tail surface of the leader's plane, slightly higher, and with his wing barely overlapping the leader's—he finds with relief that he can stay "in there".

First formation flights were very much of a strain, since it was necessary to watch the leading plane closely, to the exclusion of everything else. I remember the first time we came in for a landing—I had no idea that we were even close to the field. The leader uses a system of signals:

Move ailerons up and down—Get ready for take-off.

Nodding head right or left—Right or left turn.

Bending forward in seat—A dive.

A cadet's peashooter is carefully checked and tightened up before each day's flying.

Several quick bending movements back in seat—Reduce speed.

Clenched fist moved back—Change propeller pitch.

Several quick zooms and dives—We're going to land.

Circular hand motion—Roll down flaps.

After receiving the landing signal, planes in wing positions move out and drop down slightly as an extra safety factor. Wheel-first landings are generally made at first but after practice you are able to look up and over at your leader and judge just how high he is, then see the ground as it comes up.

Formation flying is very important in that it is the basis of almost all present-day war maneuvers. The day of the "ace" who flew by himself—as he pleased, trusting to skill and good luck—is over.

One of my friends found that out last week. He was alone, amusing himself by flying somewhat nearer the ground than flying regulations permit. An instructor who was leading a three-ship formation saw him and decided to chase him and get his number. So without a word of warning to the two students with him, he put his nose down and took out after the culprit, leaving the wing men scrambling after him in some confusion. The chase lasted over 45 minutes. Then, the hedge-hopper caught, the instructor throttled back and allowed the two perspiring and puzzled students—who had been steaming along wide open about a quarter of a mile behind him through climbs, dives, vertical reverses and all the other maneuvers in an impromptu dog-fight—to catch up.

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If formation flying is ice cream, instrument flying is spinach. It's very important, very valuable training and all that, but it's certainly no fun. You fly under a hood, which is hot and uncomfortable, and the average student is so tense and works so hard at it at first that he is exhausted at the end of 45 minutes. Every flyer knows, or has been told, of the sensation of "vertigo"; that feeling that you are turning in the opposite direction when you recover to straight and level flight from a turn. Forewarned as he may be, however, anyone flying "blind" for the first time will be fooled repeatedly into distrusting his instruments. Almost every student at some time or another has caught himself pushing very hard on the left rudder to center the turn indicator, only to defeat his own purpose by unconsciously pushing just as hard on the right rudder. But with practice the turn indicator, ball, rate of climb and airspeed become familiar and trustworthy instruments.

Currently popular as an Air Corps trainer is the Seversky BT-9. Note the well-planned instrument panel.

Basic training at Randolph includes about ten hours under the hood. During this time the student learns how to fly straight and level, make medium and steep turns, time turns with the needle and clock (a 360 degree turn takes two minutes), maintain a compass course, and recover from unusual positions. These include spins, tight spirals, and anything else that the instructor might think up. These instructors have very fertile imaginations. Mine one day started the plane in a snap roll and shook the stick for me to take it after we had gone around about 1½ times. The plane finally settled down after I had kicked it around practically all over the surrounding sector of sky. He didn't say anything, but I thought I detected a glint of amusement in his eye when he returned my salute and walked off that morning.

At this time students can enter one of three divisions in the Air Corps: pursuit, attack and observation—the bombardment section for students having been temporarily discontinued. Several weeks ago we found into which section we had been placed. I am in the "pea-shooter" or pursuit group. Boys who drew observation are called "the glassy eyes of the army". Good-natured ribbing is constantly going on between the different groups.

Last week an attack plane dived and flashed across the field barely three feet off the ground going well over 200 m.p.h. "Boy!" said an attacker, "Look at that guy go!" Turning to his pursuiter roommate he said, "That A-17-A is a real airplane."

"Oh," said the pursuiter, "was that what it was? I thought it was a P-36 (pursuit) gliding in for a landing."

"Well," said the attacker, "at least when I fly, I climb into an airplane. I don't just strap on a wing under my chute and take off."

"Okay, smart guy," said the pursuiter, "I may strap my airplane on my seat pack, but at least I can get above 2,000 feet and have enough altitude to bail out, which is higher than your hay-burner will go."

"My mother," said the attacker, "told me to fly low and slow and take no chances."

Our first night cross-country trip started from Corpus Christi. We had left Randolph Field early in the afternoon and flown first to Kingsville and then to Corpus Christi. Our planes were gassed and we ate supper. At 7:15 p.m. the first man took off, circled the field and headed toward Randolph. When my turn came, I took off, circled and climbed to 3,300 feet. Below I could see several lines of beacon lights, so I set the plane on the compass course to Randolph and flew for five minutes to be sure and get on the correct beacon line. Ahead I could see three blinker lights on my course. When the visibility becomes so poor that we cannot see two beacons ahead (which is 20 miles) our instructions are to return to the point of take off or land at some emergency field along the route. These fields can be easily seen from the air since they have green lights around the boundary.

Small towns and other check points which show up clearly in the daytime are almost impossible to locate at night, so that it is harder to get an accurate check on speed and distance. Therefore it is necessary that you stay on the beacon line at all times or at least have an accurate idea as to your position.

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A New Propeller

INVENTION of a "directional blade propeller" for increasing the efficiency of the airplane in flight has been announced by Marshall C. Long of Kansas City, Mo., a senior in the Princeton School of Engineering. The design is expected to overcome problems which have been studied by engineers for a number of years.

Long's propeller takes advantage of the principles of aerodynamics to achieve two goals. The device succeeds in confining the air upon which the propeller works to the area circumscribed by the whirling blades, while at the same time it makes use of the interplay of air forces on the propeller itself to aid the blades in turning.

While working on the invention, Long developed two additional aids in airplane design, a universal joint mounting for propellers and a simplified method of testing their efficiency.

Long's invention consists of mounting, or crowning each tip of the eight-foot blade with a small oval metal plate. The plate is approximately eight by 10 inches for standard blades, but varies in size with corresponding changes in the blade's design.

The mounting was developed in an effort to eliminate inequalities existing in the two sections of the propellers he was using for experiments. To compensate for differences in test readings caused by the variation between the two ends, the inventor developed the universal joint mounting.

The new mounting, assuming the characteristics of a gyroscope, automatically equalizes the fluctuations between the ends of the blades. In addition, the gyroscopic effect allows a plane to rise more rapidly and sharply by holding the propeller in its original position while the nose of the plane is pointed upward, thus thrusting up the front end of the plane.

A device to test simultaneously the torque and thrust of the blade was next developed by the engineering student. The mechanism contains an electric motor for driving the propeller and is set in a large frame which swings along a testing scale like a huge pendulum.

Tsk! Tsk! Tsk!

DOWN in Texas a pilot was flying cross country in a ship powered with an old Liberty engine. This job had a hood over the nose that opened forward. Suddenly there was a bang and the hood flew open held only by the rear hinges. The plane slowed down as if it had been dragging an anchor.

The hood offered so much resistance to the air that the plane lost flying speed and began to settle rapidly towards the ground, in spite of the pilot's vigorous gunning of the engine. There was nothing he could do but just sit pat, and the plane settled like a tired old hen into a wild apple tree.

He Invented the Metalclad

by JOHN W. HIGGINS

ALTHOUGH David Schwartz, a Jew born in Austria, never lived to realize his dreams, he gave to the world its first rigid airship.

It was a metalclad and was built in Berlin. It was a small ship, being only 135 feet long and having a diameter of 45 feet. The metal covering was a very thin aluminum. Schwartz died just before it was ready for inflation, but his faithful wife carried on, engaging a man named Jagels Platz to act as its pilot.

In its first flight, November 3rd, 1897, the driving belts slipped off their pulleys on the crude engine and the powerless craft, with one man on board, was carried by the wind to a forced landing in a forest. The ship was badly damaged and was soon dismantled by souvenir hunters and therefore the task was passed on to succeeding generations having better engines, stronger aluminum alloys and a higher degree of technical skill.

A short time later, the automobile brought with it the necessity for finer metals, more perfect alloys and better engines. Then came the crucial period of the World War which spurred metallurgists of every nation to greater endeavours. Governments poured money into all phases of aeronautic development and thereby brought about a remarkable advance in the new art of flight. Each department of science made its contribution. With the return of peace the time was ripe for the next logical step.

In the early stages of any development the soundness of the scientific principles involved, rather than the choice of materials used, receives the most emphasis.

The Navy's ZMC-2 proved itself the world's most successful metalclad blimp. It still is in active service and is strong propaganda in favor of this type blimp.

And so Count Zeppelin, who had purchased Schwartz's patents, immediately discarded aluminum covering for the more easily procurable fabric. It is logical to assume he was right for it was too early for the metalclad airship. As we can appreciate fundamental principles and demonstration have always had precedence over refinement of materials and design during the experimental stage.

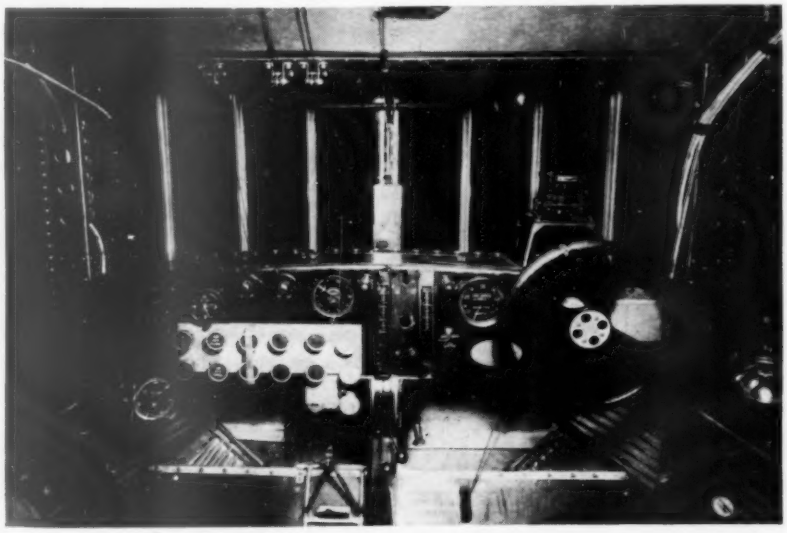
After the feasibility of a scheme has been proved, the next step is the introduction of better materials and refinement of design in order to gain greater efficiency. The airship has now reached this stage. Durability, cost of upkeep, strength and weight combination and economy of operation are certainly some of the factors that now must be considered. They may have been of minor importance during the early stages of development, but they become dominating ones under commercial conditions. Witness the *Hindenburg* holocaust.

Certain materials, such as fabrics, complex systems of wiring, etc., which have variable strength, which deteriorate rapidly or are easily damaged should certainly be replaced by others possessing not only greater strength but also most important—fireproofness.

In an article entitled "The All-Metal Airship ZMC-2," which appeared in the April issue of POPULAR AVIATION, it was brought out that one need only review the substitution of metal for steamships, railroad cars, bridges, etc., formerly built mainly of wood to realize fairness in the contention that America, in the light of what happened to her fabric rigids of the Zeppelin type, should concentrate from now on the metalclad system entirely.

It is indeed a tribute to David Schwartz that the only successful rigid airship now in operation in the world is a metalclad. His idea has lived and is personified in the successful all-metal airship ZMC-2, which has been in operation for the past eight years at the United States Naval Air Station in Lakehurst, New Jersey. This unique ship has exceeded all expectations and in the course of its long career has worn out two sets of engines in making hundreds of successful flights.

The engineering research and investigation by those responsible for this most successful airship has been carried on. A most important conclusion by this group reveals that, as metalclad airships increase in size, the difficulties of design, fabrication and construction decrease proportionately. In the course of this finding, hypothetical metal ships of dif-



This is the control cabin of the Navy's ZMC-2 shown at the top of the page. Note the instruments for the two engines and the controls on the right side.

ferent sizes were designed in considerable detail and a thorough stress analysis involving even the integration of all forces as applied to each square foot of the hull surface was worked out carefully.

No experimental effort was spared through actual physical test to verify the theory of design, of the main bending and shearing action and of the safety factors involved. So gradually through years of patient and systematic effort the general theory of the metalclad airship was mathematically and experimentally proved.

The fabric covered airship has carried with it the burden of certain disadvantages as did every form of apparatus, but such problems were more often solved by people whose minds were not staled by too long association with those problems, and who adopted a new line of reasoning altogether.

When some years ago a proposal was made by a group of men in Detroit mainly identified with the automotive industry to construct an airship in a manner embodying the principles applied in submarines—having a metallic covering which would serve as the shell and as the gas container it was deemed to be a task that could only end in failure. Yet they went ahead with a boldness which compelled admiration, the remarkable record of their first ship has shown how astoundingly successful the first attempt has been.

Of outstanding interest is the following prophetic excerpt from the late Colonel Richmond's last scientific address delivered before the British Association for the Advancement of Science at Bristol, England, September 8th, 1930:—"Filled with helium, driven by engines burning heavy fuel oil and sheathed in metal, there is no reason why the airship should not become the safest form of transport yet devised."

It is believed the prophetic words of Colonel Richmond's will come true. The building and operation of a successful "metal sheathing" airship has been accomplished. The location of helium deposits of great quantity in the United States is well known and the cost of separation from the natural gas in which it is found is decreasing each year. With respect to heavy-oil burning engines or Diesels, they are now available of sufficient light weight per horsepower for airship use.

With such an airship as outlined by Colonel Richmond, the danger of fire or explosion such as the *Hindenburg* suffered will be absolutely abolished. Freedom from danger of lightning will be analogous to that of steel steamships; structural safety factors will be increased; and a speed in excess of 100 miles per hour practicable.

With the metal covering there will be no bursting gas chambers; diffusion of helium will be reduced one-half in comparison to the fabric type of the same size, thus limiting operating charges

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Akron's Cloudhoppers Lose a Ship

by Helen Waterhouse

Despite recent bad luck in the loss of their single airplane, Akron's wide-awake air-minded university students are busily planning for their next ship.

THE Akron University Cloudhoppers are still hopping the clouds.

A wrecked plane and the narrow escape from death of two of their best pilots, failed to prevent them from winning the intercollegiate meet with Kenyon Aviation Club held here recently, and though their hearts were heavy with the loss of their ship, they kept gamely on.

Flying in borrowed and hired planes, the remaining members of the club, dropped bombs accurately and made spot landings which netted them the score of 13 points over Kenyon's 9.

They tried to forget that their one ship, earned by long months of saving pennies during their university careers, was a crushed mass of wood and metal at the bottom of a gully.

Even the two pilots themselves, one of whom was found afterwards to be suffering severe injuries to his spine, attended the meet, bandaged and white-faced, but game.

"We are going right on with our flying," they announced. "We will get a new ship." Hurtling 150 feet to the ground, the plane, christened, "Miss Akron University," was "washed out" during a treasure hunt which was the first event on a long afternoon program.

The ship's motor conked out, just after the plane had taken off from Stow Field on the second lap of a three-cornered race, which also included Mid-City airport in Hudson, Ohio, on its course.

Pilot of the plant, Bob Easton, a Firestone employe and graduate of the university, was pinned in the wreckage. His co-pilot, Lanier Carrier, riding in the rear cockpit, escaped injury, although he was knocked out from the force of the blow, when he was thrown many feet from the plane.

"We had just been flagged off on the second lap of the race at Stow Field," related Easton. "The long runway at that field lies north and south, so I chose to take off on that, which meant that I was flying cross wind.

"That's poor flying, of course, and I realize I was foolish.

"Just as we banked our motor conked out. I suppose I should have kept right on and landed in some trees up ahead, but instead I thought only of the ship and that I wanted to save it.

"So I tried to turn around and go back to the field. One wing went down, and then it was all over, I guess. We had lost speed and we went into a stall. The floor came up under my knees in big cracks. I was afraid of fire because I couldn't get out of the wreckage. Then everything went black.

"I remember yelling at Bob, 'Get into the wind'," said Carrier.

The boys were pulled from the wreckage and rushed to a hospital where X-rays were made, then they pluckily returned to Akron airport where the meet was in progress.

Two members of the Cloudhopper's organization, girl friends of the two injured pilots, hearing of the crash as they waited at Akron airport, hopped into other planes and flew over in great excitement to find their "boy friends."

The Kistler trophy for the college winning the most events in the meet was presented to the Cloudhopper's organization. The Junior Chamber of Commerce cup for the winner of the ill-fated trophy hunt was presented to the Kenyon college flyers who were accompanied to Akron by their aeronautic's instructor, Professor Donald Gretzer.

One of the young Kenyon contestants was Clark Henderson, son of Col. Paul Henderson, former assistant postmaster general of the United States and an air pioneer of note. The Kenyon boys remained in Akron for two nights during the meet.

(*Concluded on page* 93)

"Flight" photograph

NO PILOT SITS AT THESE CONTROLS

GREAT BRITAIN has been using radio-controlled target airplanes for some time. These pilotless aircraft have proved so successful that manufacturers are producing them. Above is the new Airspeed *Queen Wasp* on a radio-takeoff.

500 Miles for $4.72—by Air

by HOWARD MORTON
(as told to Ralph Brockway)

This interesting little yarn is for the fellow who insists flying is an expensive pastime. A cent-and-a-half per mile is cheap transportation anywhere.

IN my pocket as I stood for the first time at the Taylor *Cub* factory at Bradford, Pennsylvania, was $6.00 and a telegram saying our ship would be ready that day.

The ship was ready excepting that it had no wings. It was then five o'clock in the morning, and I had 500 miles to go. I was taking off without compass or other navigation instruments and it turned out that I had about five hours in which to think about these things for it wasn't until 10:15 o'clock that my plane was ready and I took off, but not with six dollars for I had decided that I must have a watch so I had spent one dollar for that. Praise be to Ingersoll!

My lack of flying experience weighed heavily upon my spirits as I considered the young mountains rising 1,500 feet almost straight up on each side of the narrow runway which served as a flying field regardless of which way the wind blew. I could see that waggling the joy-stick to get that *Cub* back through and over those tree-covered mountains and 500 miles to Flint, Michigan, was not going to be so joyful and time was flying and I was not so I shot in the throttle and started battling that cross wind that tried to splinter me on the mountainside. The weather was cloudy but I was told it would be all right to take off although my friends at the factory said,

"You won't make Flint, Michigan, today!"

I had it in my mind that I could, so set myself to do the best job of flying I'd ever done.

I was to fly up the valley north until I came to the Allegheny River where I would turn right and follow it to Warren, Pennsylvania. Never had I flown crosscountry over such wilds as these. As far as I could see there were only mountains completely covered with woods with never a cleared space, field or even a road. No buildings nor any sign of human habitation. If the motor stopped I'd be a Rip Van Winkle—forever!

Bucking a husky cross-wind and straining my eyes to catch sight of the Allegheny River I ran into clouds, then more clouds until I was bouncing along in a veritable pudding of mountain tops and clouds. Within a half hour after taking off I could see nothing. I had glimpsed the river and turned to follow it only to run into solid clouds where I could see nothing and the 25 m.p.h. cross-wind was drifting me southwest.

It was too much for me. I decided to turn back, and did make a half turn, when the clouds opened up and I could see the ground. This bolstered up my courage so I resumed what I hoped was my course.

Shown with their new Taylor "Cub" is the author (right) and his co-owner of the ship, Robert Heath (left). They fly week-ends at Flint's Bishop airport.

I was now at 2,000 feet some 500 feet above the mountain tops, flying through clouds, catching sight of the ground for only a few seconds at a time with periods of blind flying of six to eight minutes which seemed like an hour to me. I lost the river and was entirely at a loss to know what to do when, through an opening in the clouds, I noticed a high tension line undulating over the mountains. Quickly looking on my map I found this ran straight to Warren, Pennsylvania, my first stop, so I came down to 1,800 feet and followed it, popping in and out of clouds and trying my best to hold just enough rudder to offset the cross-wind.

Following that high tension line was high tension work and when I finally picked up Warren I found I had to make a cross-wind landing in another narrow valley bottom and to make it more difficult I had to come down over the river, then sideslip over the top of the high tension wires with throttle nearly wide open to buck that cross-wind and make a landing on rough ground. I did it all nicely though and, after taxiing through a 30 foot pond of water to a depth over the wheels to get up to the gas pump, I climbed out and found myself shaking like a leaf.

An hour and 15 minutes of playing hide and seek with mountain tops at 70 m.p.h. through clouds should have been enough flying for me for one day but I was due in Flint that night so prevailed on the airport owner to run me into town for a hamburg and coffee the only food I had between the factory and my home port. I took off in clouds again for Erie, Pennsylvania.

The airport owner at Warren was a fine fellow. His easy way of talking calmed my nervousness and he gave me good instructions on the next leg of my flight, 70 miles to Erie. Again the high tension line was my guide. I had only to keep it in sight all the way to Erie. The cross head wind was still against me and kept me crawfishing all the way but the clouds were fewer and I had no bad moments. At 1:10 I landed at Erie airport only to find they were all out of gas so I flew ten miles farther to Erie County Airport.

While gassing my ship I stepped on one of the tires to shake the ship to see if the gas tank was full. The tire went flat under me. The valve stem was broken at the root. It took an hour and 15 minutes to fix the tire. We had to codger it up with a metal extension leaving the rubber valve stem wadded up inside the tire.

I took off again at 2:25 for Willoughby, Ohio, 70 miles down the shore of Lake Erie and again I was told that I couldn't make Flint before dark. The weather now was beautiful. The visibility was perfect and at 3:25 I landed in an inch of water at Willoughby. After a few minutes' stop for gas I was off again climbing to 5,000 feet over Lake Erie and two miles off shore heading for Parker, Ohio, another 70 mile jump along Lake Erie.

The wind was with me now and I made better time, setting down at Parker on another small, wet field at 4:30. Ten minutes later I was up and away for Toledo. All went well with

(*Concluded on page* 93)

This Airline Pilot Business

by WALTER van HAITSMA

Here is what's what concerning those hardy fellows at the controls of our airliners. The author is an official of the Boeing School of Aeronautics.

WE have received hundreds of requests from POPULAR AVIATION readers for the "inside" on what a fellow is up against if he intends becoming an airline pilot. We ourselves have been somewhat hard pressed to answer these requests. Now we are fortunate in having a goodly portion of the intricate story from a man who knows it.

THERE is a too-common belief that the airline pilot will in time become a mere chauffeur for an airplane.

On the contrary, the piloting on air transport lines is constantly becoming more technical in its requirements, more exacting as to personality, and more varied as to the duties involved. Not only must a first pilot be capable of assuming complete command of the operation and navigation of the plane under his control, but he is also held responsible for the passengers and cargo.

He must furthermore possess the qualities which will enable him to sell air transportation through the confidence he inspires in his passengers by his courtesy in dealing with them. A number of domestic airlines are using pilots on a part time basis in a sales promotion capacity, in which they work jointly with traffic men in presenting programs before Business Men's Clubs and other organizations.

On at least one airline engaged in foreign commerce, pilots must acquire airplane mechanic, airplane engine mechanic and first class radio code operator's licenses so that they may carry full executive responsibility for both flying and ground operations on their divisions. They must carry on diplomatic relations with the countries served by their line and become thoroughly familiar with their language and industrial geography so that they may serve intelligently both the passengers and those with whom these visitors to foreign countries wish to do business.

By the time a man has worked and fought his way to the left-hand seat of an airliner, he has earned his pay.

Co-pilots or "mates" on domestic airlines usually serve as radio operators and put in sufficient time as pilots to enable them to qualify for and attain a Bureau of Air Commerce Scheduled Air Transport Rating during a minimum period of time. They also supervise and aid in the refueling and servicing of the plane at stations.

On some domestic lines, co-pilots serve as stewards by waiting on passengers, seeing to it that seat belts are fastened before takeoffs and landings, serving lunches aloft, collecting fares, checking baggage, pointing out matters of scenic interest to passengers and in every way making them comfortable. These duties are performed by stewardesses, who are registered nurses, especially chosen for their personality and qualifications for their duties as hostesses.

The writer is indebted to Dr. E. H. Padden, flight surgeon of the Boeing School of Aeronautics, for the following statement covering the physical and personal requirements which pilots must meet to qualify for a position on an airline:

"To be considered as suitable material for a pilot's position with any airline is a compliment of which any man would be envious.

"Not only must he be of excellent physique with especial reference to the special senses but he must possess that finer trait of character, sociability and amenability that go to make up the aggressive yet genial companion.

Thus, it becomes plainly apparent that far more than medical requirements are looked for by the flight surgeon, but in addition a good bit of psycho-analysis is included which is intangible as to description to be sure but upon which there is placed a great deal of responsibility and trust.

"We expect eyes that are in such condition that no refraction help is necessary for good vision; yet by this is not meant that an individual who wears a correction to preserve his eyesight is rejected.

"A good sense of equilibrium and a normal healthy mouth, throat and middle ear with its equilibrial apparatus, are required.

"A healthy heart and lungs that are well able to cope with any unusual requirements, such as extreme altitude, is demanded and, of course, a well functioning kidney system, with its all-important role of excretion, is important.

"Normal appetite and well functioning stomach and alimentary tract are necessary if the individual is to be kept in good trim.

"In summary, I might say, we want not a superman, but an individual who is possessed of a good physique, who is well grounded in the fundamentals of character and judgment and who has an earnestness and enthusiasm about his work—and, in addition, who has a pleasing personality. In fact, if an individual possess these traits, he cannot fail in any line of work."

Student pilots as well as co-pilots, reserve, first and chief pilots on an airline must pass a searching physical examination once monthly. Failure to do so results in their being grounded until the difficulty is overcome.

Never is there any hesitation on the parts of either the Bureau of Air Commerce medical examiners—or those maintained by the airlines themselves. If an airline's pilot shows the slightest sign of

his general physical condition dropping to the extent that his safety in the air might be affected, he is grounded immediately. It is one of the standing chores of the airline pilot to visit examining physicians at least once monthly. Some airlines, however, require their pilots to be examined by their doctors as well.

In a memorandum to pilots and operators on the subject "Air Commerce Flight Test for License," published on November 15, 1934, by the Eighth Inspection District of the Bureau of Air Commerce, appeared the following paragraph:

"This is not meant to be a manual of flight training, but to emphasize the fact that, in order to fly a satisfactory test, good instruction and plenty of practice are necessary. You cannot teach yourself to fly. Mere hours in the air mean nothing without proper flight supervision."

Proper flight supervision involves an instructor who has had actual airline piloting experience, who not only has a thorough understanding of what is required in the way of instruction, but who has the patience and ability to impart knowledge derived from his own personal experience to his students and who in every way commands their respect.

Equally important is an adequate flight curriculum, designed to develop the student's skill, beginning with the fundamentals and leading by successive stages of increasing difficulty to the final technical maneuvers which qualify him to serve his apprenticeship as a co-pilot or mate, and to pass without difficulty the Bureau of Air Commerce examination for a Scheduled Air Transport Rating after sufficient flying time has been logged.

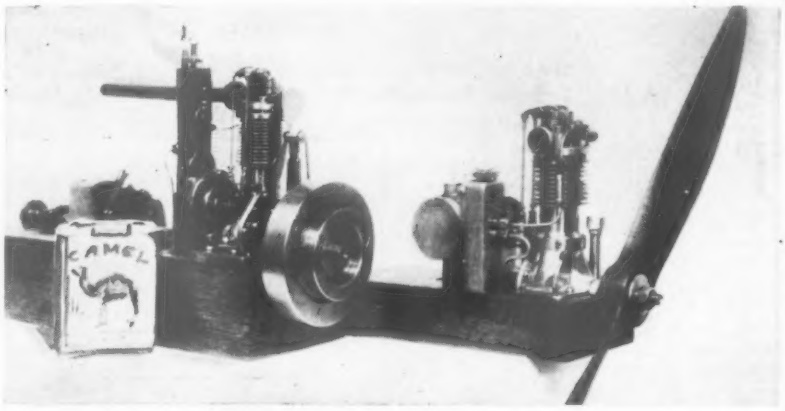
Flying equipment must essentially be so varied as to type and power as to give the student broad experience in many types of ships involving both single and multi-motored planes equipped for instrument and landing beam flying as it is conducted on regular air transport lines.

Technical training, too, must be thorough in detail and comprehensive in scope. To qualify as a pilot, one must be well versed in the fundamentals of mathematics and physics so that he may have no difficulty in keeping pace with technical developments in flight equipment and thus assure holding his position.

A thorough practical understanding of aerodynamics, meterology avigation, both dead reckoning and celestial, and air transport economy, is indispensable. Experience and a technical understanding of the principles involved in the operation of motors, airplanes, radio and instrument equipment, are equally as important as flying skill in determining a pilot's advancement towards positions of increased responsibility and his ability to meet Bureau of Air Com-

(*Continued on Page* 88)

Here's a Model Diesel Engine!



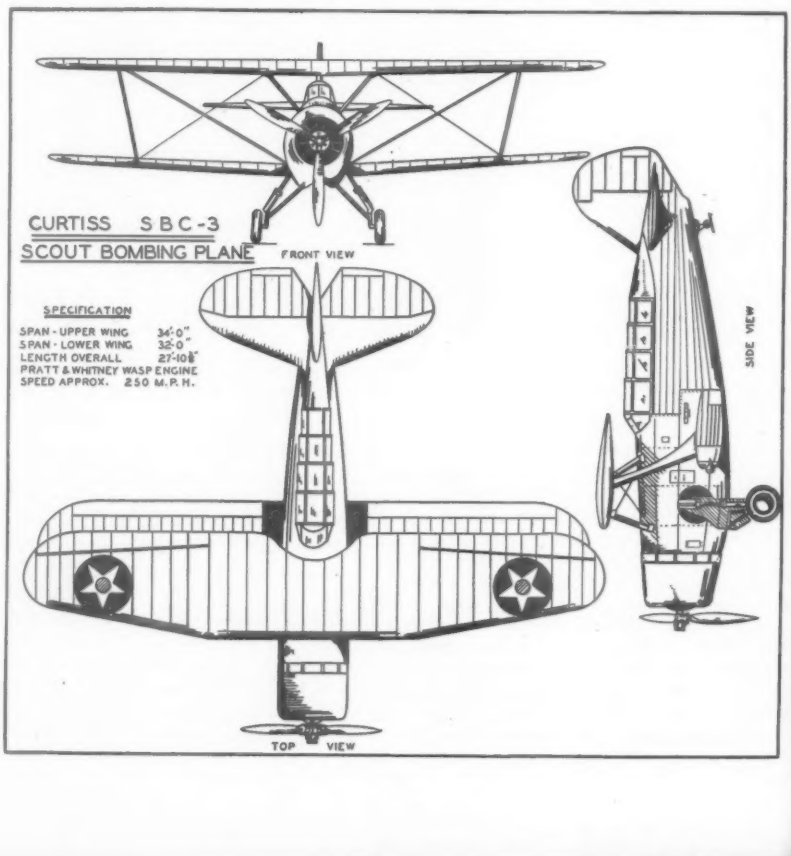
These two tiny Diesel engines (note cigarette pack) are said to run very well.

HERE is something for the model airplane fan to strive for—a model Diesel engine! Before going further, however, we wish to tell you that the author has asked that we not reveal either his name or address. So please do not write this magazine for this information.

According to the designer, the model Diesel engine "has everything". It runs perfectly, has no ignition, burns crude oil and develops ¼ h.p.

A Modern Navy Scout Bomber

NOW in standard use throughout the U. S. Navy is the Curtiss SBC-3 (Scout Bomber Curtiss—Model 3) shown in the drawing below. This sturdy two-place ship serves extensively aboard American aircraft carriers. Powered with a *Twin Wasp* engine, this ship is said to have a top speed of 250 m.p.h., unusual for this particular type airplane. Features of the ship include a tapered sliding hatch over both cockpits, the typical Curtiss retractable undercarriage, constant-speed propeller and the new N.A.C.A. cowling fitted with flaps that can be controlled in flight by the pilot.



Fuel Injection vs. Carburetion

In this brief and non-technical article, graphic comparison is made between engines employing carbureters and those equipped with the comparatively recent fuel injection systems now being operated experimentally.

THE limiting factor of modern aircraft motors is, not infrequently, the carbureter.

The military pilot finds that the carbureter-float hampers the execution of certain maneuvers held indispensable for combat duties. Also, at high altitudes even in midsummer, ice may form at the carbureter throttle. This latter trouble is also encountered by transport pilots during the winter season.

Thus, it is but natural that efforts are being made to eliminate the carburetor altogether. Abroad, the latest types of aircraft engines, are equipped with a fuel pump, a device similar to the pumps used in connection with Diesel engines. A six cylinder fuel pump is illustrated in Fig. 1.

Such a pump consists essentially of a camshaft and a number of plungers (pistons). The customary construction features grooved sleeves, each plunger being surrounded by such a sleeve. The plungers are about ¼-inch diameter and have an effective pumping-stroke of ½-inch or less. The plungers measure and force out a given quantity of gasoline, irrespective of power requirements, to grooved sleeves being relied upon to by-pass the fuel not needed for a given engine load.

Thus, the sleeves take the place of the carbureter throttle. By-passing most of the fuel reduces the engine's speed and power. Reducing the fuel by-passing has the opposite effect upon the engine. The internal arrangement of a fuel pump is shown in Fig. 2.

Such fuel pumps have for years been standard for compression-ignition (Diesel) engines, oil being the fuel used. In adapting such pumps for gasoline, difficulties were at first experienced. While Diesel fuel oil is by no means a suitable lubricant, yet it does not wash the lubricating oil-film from the plungers and sleeves as gasoline does.

The ablution caused by the gasoline was finally overcome by providing either suitable ducts for better lubrication of the plungers and sleeves, or by mixing a small amount of oil with the gasoline. Pumps such as the above have now given hundreds of hours of satisfactory service without a trace of sticking or scoring.

In the carbureter fed motor both air and fuel are drawn in together, whereas in this new system, air alone is drawn in via the intake valve.

The fuel is injected in a solid stream before the piston reaches T.D.C. and the spark is also timed so as to occur ahead of T.D.C. The scheme is shown graphically in Fig. 3.

Fuel is injected for the period (a—a_1) while the crank travels in the direction of the arrow. The spark is set to occur somewhere along the line (a). Combustion takes place during the period (b—b_1).

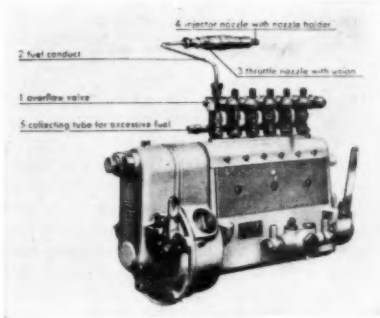

4 injector nozzle with nozzle holder
2 fuel conduct
3 throttle nozzle with union
1 overflow valve
5 collecting tube for excessive fuel

Fig. 1. Fuel injection pump.

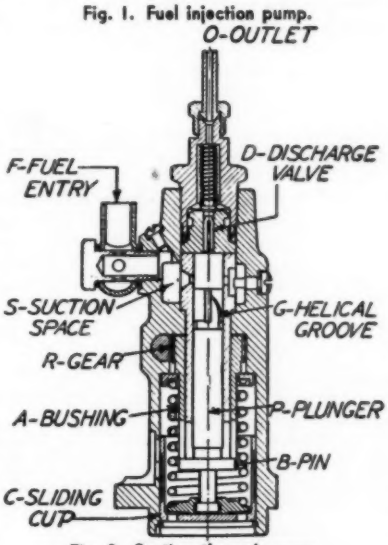


Fig. 2. Section through pump.

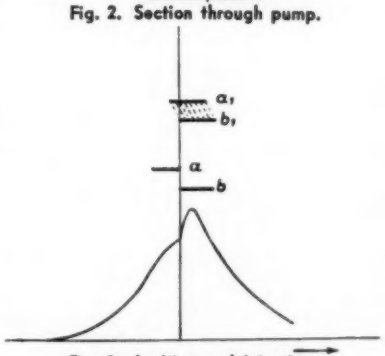


Fig. 3. Ignition and injection.

Since the injection of fuel continues long after the spark has ignited the first fuel particles, it is manifest that all fuel subsequently injected is ignited by the flame that has already formed rather than by the spark. This condition is indicated by the dotted lines between (a_1 and b_1).

This condition amounts to delayed combustion, a feature of prime importance in that while not preventing detonation, it mitigates this tendency to an almost unbelievable extent.

With oil engines, fuel is injected at pressures of from about 2,000 to 15,000 pounds per square inch, partly on account of the high compression such engines are burdened with, but mainly in order to atomize the rather heavy oil. With gasoline injection, on the other hand, a pressure of but 900 pounds per square inch has been found adequate for perfect atomization and quick combustion for engines of a compression ratio not exceeding 6½:1. Such comparatively low pressure reduces the stresses upon the pump and piping.

The salient features of injected-fuel *versus* carburetted-fuel are depicted in Fig. 5.

The motor used for this test was an experimental air-cooled motor. The solid lines indicate the performance with injected-fuel; the dotted lines are those for carburetted-fuel. It will be observed that pump injection reduced the fuel consumption some 16 per cent, from 0.77 pounds per horsepower-hour to 0.66 pounds while increasing the power developed from 51 to 65 brake-horsepower.

The seemingly high fuel consumption may be explained by saying that the motor during these tests was supercharged, the supercharger requiring in the neighborhood of 15 per cent of the total power developed by the motor. The horsepower given in the above graph was taken at the crankshaft and is hence minus the power absorbed by the supercharger.

The performance of the above motor un-supercharged is shown in Fig. 4.

The solid line indicates the fuel consumption at full load, the dash-dot line at ¾, and the dotted line at ½ load. The lowest fuel consumption—0.5 pounds per horsepower-hour—is at an engine speed of approximately 2,300 r.p.m. for all three load factors. Of special interest is the fact that the fuel consumption per horsepower developed at three-quarters and full load is higher than at half load at the lower r.p.m., whereas at the

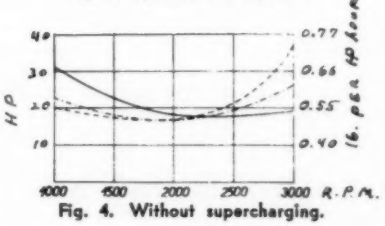


Fig. 4. Without supercharging.

Emanuel Swedenborg 18th Century Pioneer

by MARGARET WALES

Little credit has been given this far-sighted Swedish philosopher. He foresaw the airplane more than 200 years ago.

AS WE associate philosophy with flights of the intellect rather than with aviation, it is surprising to learn that the great Swedish philosopher, Emanuel Swedenborg, anticipated modern features of airplane design in his little known invention of a flying machine.

In his youth Swedenborg edited the first scientific magazine ever published in his native country. Six issues appeared during 1716, 1717, 1718. The journal was entitled "Daedalus Hyperboreus", or the northern Daedalus, after the mythical Greek sculptor who made wings for himself and his son Icarus of wax and feathers, in order to escape from a tyrant king. Icarus, flying too near the sun, was forced down, but Daedalus' flight was successful.

Of course no popular scientific magazine, least of all with the title "Daedalus", would be complete without an aviation story, and Swedenborg was astonishingly air-minded for a man of his day. In 1717 he published an article describing his invention of a "Daedalian, or machine to fly through the air". This sounds rather amusing, and was so considered by the author's learned friends, who treated him to a good deal of polite ridicule on the subject. However, "he laughs best who laughs last", and Emanuel Swedenborg would no doubt be amused to learn that over 200 years later the principles of his design have been pronounced sound by modern aeronautical engineers.

Swedenborg dropped the publication of "Daedalus" when he was appointed to an important government position as Assessor of the College of Mines, and from this time we hear no more of the flying machine. Instead, he devoted himself to his work as a mining engineer and as a member of the Swedish parliament. During these years he wrote and published volumes on metallurgy, geology, chemistry and physics, and he later made extensive researches in anatomy and physiology, anticipating modern science in this field by 150 years. Emanuel Swedenborg in middle age turned to the study of religion and produced 83 volumes on this subject, more widely known today than in his lifetime. The 250th anniversary of his birth, which falls on January 29th, 1938, is to be celebrate in all parts of the world by scientific bodies, academic organizations, and church societies. Countless scholars will pause on this day to pay tribute to the "last of the universal scholars".

Swedenborg's airplane design, although he never made a trial flight, is important in the history of aviation. In England the Royal Aeronautical Society published a description of the invention and called

Emanuel Swedenborg designed an aircraft, was famed in many other fields.

it "the first rational design for a flying machine of the airplane type."

The original manuscript in Emanuel Swedenborg's handwriting describing the invention has been preserved in the ancient Cathedral Library at Linkoping in Sweden. It is illustrated by a peculiar drawing of the machine as it would appear from the ground when in flight. The general shape of the "Daedalian" is oval and has some resemblance to a modern ship, except that it has no stabilizer, elevator, or rudder. The propeller is entirely different from the modern type, being in two separate pieces or large oars, which beat up and down in the space between the wings. These oars are so arranged as to resist the air on the downward stroke and collapse on the upward stroke. They are attached by a spiral spring to a small car in the center of the machine. The car is hung between two horizontal wings of sailcloth, tightly stretched on a light wooden frame, oval in shape, and bent to form a hollow under the tip of the wing.

As the design was originally conceived, the pilot determined the direction of the flight by swaying "downwards, upwards, or to the side", as in a hang glider. Later Swedenborg came to the conclusion that an additional wing would be necessary to direct the course "downwards or perpendicularly". In modern construction this idea has been worked out in the elevator and ailerons. He also advanced a theory that the expanse of the wings, as well as the force of the propeller, ought to be in proportion to the weight, and must increase with the weight in pro portion of three to two.

The inventor had much to say of the difficulty of getting his ship into the air, as he realized that any power available at that time was insufficient. He wrote:

"It requires greater force and less weight than exist in the human body".

As proof that the machine would fly once in the air, Swedenborg cited the kite

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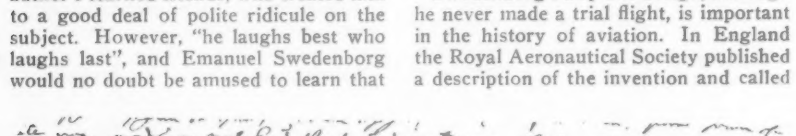


This is one of Swedenborg's drawings of his visualization of an airplane. His explanatory notes surround the drawing. Note the propeller in the center (F).

James Ewing; Air Race Maestro

by KURT CASS

Just in case you're interested, here is a detailed story on how a typical air race is set up and operated. Jim Ewing is one of air racing's leading promoters.

DO YOU know how national balloon races and national or championship air races are staged and directed? James R. Ewing, whose second name might well be "Race" is one of three men in this country who follow the unique profession of national air race director. He has no basic organization, and his own experience with both. aviation conditions—of human nature—and his assets are his own knowledge of

Ewing is a young man, with intelligent, keen brown eyes and dark hair. His most pronounced features are his eyes and a chin which fulfills the quiet determination

Although it was not always true, it would now be impossible to hold a successful national championship air race without the N. A. A. sanction. Compliance with their rules guarantees that prize money is bona fide, that events scheduled and publicity details and financial backing will be of national championship quality.

All members of the Race Pilots Association of America must compete in every one of these N. A. A. official national races in order to be eligible for the annual championship award competition, at which the five national winners are picked. T. H. Kinkade of the Gulf Refining Company, technical chief in this country and head of this Race Pilots Association, has done much to weld this group together into a cohesive and powerful organization.

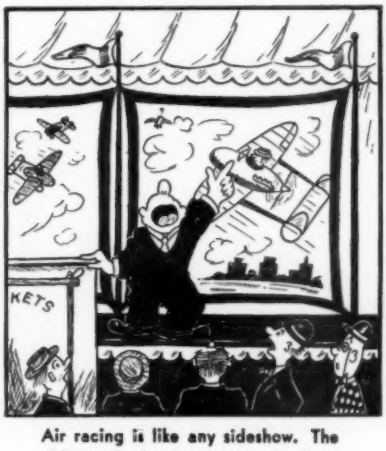
After gaining official N. A. A. sanction to hold the races, the members of this racing group are notified and their appearance is scheduled.

There are many technical difficulties, aside from satisfying N. A. A. requirements and promoting the race-idea to civic groups. Some of these have to do with racing rules, or aviation laws of the Department of Commerce designed to further safety. An automatic fine of $200 a day for the days of the races. is put on Ewing by the Department of Commerce to safeguard the races. If any of the events violates these safety rules, the fine operates automatically.

Technical difficulties in aeronautic engineering such as differences of altitude, atmospheric conditions, and ways to equalize them are important considerations. In Denver, 35,000 cubic foot balloons were necessary, due to the altitude, and 200,000 cubic feet of pure hydrogen was used. Like differences confront each separate race.

In spite of understanding and experience with the conditions surrounding aviation races, and a systematically arranged schedule and program of organization, there are still elements of a gamble about this unique form of promotion.

A total paid personnel of about 1,000 people are required to work out the details for a championship race and most of them are new to the work. Ewing cannot keep even one trained assistant, since few men of the right calibre are free to travel and free to gamble on the venture. Upon Ewing's judgment alone—his understanding of men and his ability to shift them to the best advantage, rests the success of his work. These qualities must take the place of experience and training in others. He finds his greatest difficulty in making them all "hew to the line" of their own jobs. The build-up of enthusiasm necessary to put over the race, overflows and people try



Air racing is like any sideshow. The old-time barker has just modernized.

to do the work of others to the neglect of their own.

Ticket sales, although usually allotted to civic organizations at the beginning, eventually are turned over to a professional selling agency.

National balloon races are never held two years in succession in any city. They are a feature attraction and are nearly always used in conjunction with airplane racing. Alone, the balloon races would not hold a crowd, as the excitement is over soon after the balloons are walked on to the space in front of the grandstand, where they take-off—except for the balloonists!

Air race meets, however, can be of permanent yearly value to a city by building up interest in one special event which has not been held, or could not be held elsewhere. In this way, also, the air race truly becomes a proving ground for flying.

There is no way to tell beforehand whether a town will be good for more than one race. Some towns are good repeats for baseball—football—or other sports but not for aviation. Cleveland is the best aviation city in the world. It has increased its average attendance about 20 percent a year, and that increase comes from outside of Cleveland. More people are flying to the races every year.

Weather is another handicap—and that is one that no one, not even Ewing, can control. Sometimes atmospheric conditions make balloon racing impossible and flying a terrific struggle.

Not only has the method of directing races and race technique changed enormously since the old flying circus days, but the flyers are also changed. Just after the war flyers were a reckless, devil-may-care outfit who knew very little of aeronautics except what their experience in flying had taught them and who were possessed of a restless desire to be constantly on the move. Part of this change in flyers is due to the change in aviation showmanship, as well as to better education now required of a pilot.

It is true that flyers are a race apart. No one could have the immense experience of flying—of being a part of the machine which conquers the air—without also having a perspective of earth which comes from distance and power. But instead of a circus flying crowd who spend their time barnstorming from place to place, content with "coffee and" between the big money spells and flying anything with wings and a rudder, these race pilots of today are well trained aeronautical engineers who frequently build and fly their own planes. Sometimes they are technical engineers of high standing, or executives and designers as well as flyers.

Every year the game is becoming less and less of a gamble, due to the change in racing technique, but every race is still a gamble in success. Sometimes a last minute crisis threatens to stop the show. Once the pilots of three special planes built to use at race meets found when the planes were completed they wouldn't even fly. Another time three pilots cracked up a week before the event which meant that three of the contestants had to be replaced to give the financial backers their top-liners.

Handling flyers is another big problem. Ewing likes them all. There is an erroneous idea abroad that women are more temperamental than men. Ewing has not found this to be true, but he does believe men can be more easily steered to see the error of their ways. Women—sometimes—just pack up their dolls and go home!

National Aeronautic Association officials and Department of Commerce in-

(*Concluded on page* 95)

Old Days at Hempstead Plains

by CAPT. HUGH C. DOWNEY

Here are further reminiscences by the author about Hempstead Plains, the weed-covered field that once hummed with aviation's pioneering men and flights.

THE first part of Captain Downey's interesting story appeared in the November issue of POPULAR AVIATION. *The following is the remainder of the story of that historical New York flying field.*

Bellanca was there too, with his strange open work fuselage monoplanes. They flew very well though. And, today, Bellanca is a successful airplane manufacturer who is noted for getting just a little more performance from his creations than the other fellow. He was an Italian but he hailed from Brooklyn and he got results.

Then there was winsome Allan Adams, pleasant Tex Millman, the dashing Bert Acosta and the spectacular De Lloyd Thompson. De Lloyd had a passion for flying and stunting at night with magnesium flares on his ship. Where would one find such men again? They were not fostered by any government and they did things on their own.

Some of them were just flyers but most of them were real flyers and mechanics too, and some were engineers beside. A few of them are still in the aviation industry, but verily I believe if they were all here they would find it too humdrum today. They wanted romance, spice and adventure which is mostly conspicuous by its absence today.

"The boys at Hempstead Plains" were noted for their willingness to try anything. Here is Eugene Ely making his famous flight from a warship's deck.

You've heard of Charles Kirkham from Bath, N. Y., who seemed to build better engines than most. They would run longer, weighed less and developed a little more power than most early engines. He built engines for everything from a Wright Model B on floats at Tarrytown, N. Y., to Curtiss type pushers at Mineola. Rausenberger, or Rausie for short, built that 12-cylinder, 100 horsepower "V" engine for Cecil Peoli that drove him so fast that it tore all the fabric off his wings. This spelled finis for Cecil because there were no parachutes then that you could use with an airplane. And, of course, we had old man Roberts with his roaring 2-cycles that spat a three foot sheet of flame out of the exhaust ports and literally ran like a house afire.

On many occasions they had no place to sleep, these men, but in the hangars and were very glad of that shelter. Very often they lacked a square meal. Then, perhaps, a successful exhibition date was completed and joy was great among them.

Another indispensable figure was Ernest Jones who ran the magazine *Aeronautics* in New York and who gave the boys the latest dope on developments in planes and engines abroad.

Howard Blakely was another pilot of yore. He had a discussion with Frank La Vista one day. Said Frank, who was of a scientific turn of mind.

"You know Howard, we ought to have oil pressure and gas pressure gauges on these planes."

"What for do I want such junk?" said Howard.

"Well, so you'll know when the oil or gas pressure goes down," said Frank.

"The engine's gonna stop then, ain't it?"

"Well, yes," said Frank.

"So what the hell good do they do me then?" says Howard.

Frank Burnside was my very good friend. He gave me my first ride in a Thomas boat over the beautiful Hudson at Dobbs Ferry. Frank was a jewel.

There was the day when Frank La Vista flew a Curtiss boat at Bay shore with practically no instruction nor permission and got in trouble for it but that didn't make any difference to Frank because you see he had built a plane and had a great ambition to fly. It was Frank too who put the compass in an F boat and nobody could understand why he wanted anything like that.

But, I must not forget Lawrence Sperry and the day he looped the F boat. He was grand. Brilliant, eccentric, but there never was a man who could better Lawrence at flying. Lawrence had a Curtiss boat many years ago at Amityville and flew it whenever the opportunity offered. There was nothing that Lawrence couldn't do in the air.

They sat around the old fashioned coal stove in Henrichs' hangar. It was January. It was cold and rainy outside, typical Long Island winter weather. Strahm, Worley, Frank La Vista, Frank Blair, George Page and myself.

The gusty wind blew a shower of gravel against the hangar door while, La Vista sang, "By the Old Mill Stream." There wasn't much going on that day.

Seagraves came in out of the rain and banged the door behind him. Seagraves was slim and quick and catlike in his movements.

"Just saw Archy and Donald Black. They'll be in, in a moment," he said.

"And what do they want?" said Blair.

"They're out here to have a look at Young's nightmare," said the Australian.

The Blacks arrived and warmed themselves by the stove.

Then Worley produced a picture of Bob Simon standing up out between the wings of Lawrence Sperry's flying boat while it was in flight.

"It's a fake," said Frank Blair.

But Frank La Vista didn't see why it couldn't be done.

They argued the thing pro and con until Archy Black settled it. He said Lawrence had an automatic stabilizer or automatic pilot that would hold the plane steady when a man couldn't.

Cocky Walter Brookins stopped in there that day—you remember the famous old Wright pilot. The boys thought him a trifle uppish, but that was probably because of their inborn feelings. All the local Long Islanders were inclined to support the Curtiss school and at that time the Wrights and Curtiss were not exactly friends.

There were two schools of thought then. The pusher school and the tractor school and many were the arguments over the merits of each system of driving an airplane.

Suave Seagraves was a European and he said the French had forgotten more about it than all the others including the

Americans put together and in France all the wise guys had tractors.

"Well if the frogs do it that's a good reason why we shouldn't," said Frank Blair, laughing at his own wit.

But Seagraves assumed a superior air and said, "Now when I flew that Nieuport in Moscow I used to chew tobacco and all I had to do was spit over the side and the tobacco juice would fly away. You couldn't do that in a pusher. The wind would blow it down your throat."

There was no answer to that except that Frank Blair let out a long derisive yowl.

The boys decided finally that, after all, if you cracked up in a pusher you were likely to have the engine on your neck but in a tractor you had a better chance. Frank Blair was a machinist and a good one but only a machinist and he knew it, and he didn't like the pencil pushers as he called the engineers.

"You're clever, so you tell me what keeps the airplane up in the air," said lean sardonic Frank to thoughtful Donald Black. Donald, a pencil pusher, opined that maybe it was the engine.

"Ha ha, and wouldn't you be in a hell of a fix without wings," whereupon Don thought it might be a combination of both.

"Or maybe it's the propeller or maybe it's the gasoline or maybe it's the pilot or maybe it's the hot air I hear around here," said Frank and he shrieked with his peculiar crackling laugh at this joke that he had been thinking up for days. I haven't yet heard a good answer for his poser.

Then, suddenly, Charlie Willard cracked up in a stone quarry at Quebec and they gave him up for dead. But Charlie was tough. He was out of the hospital in three months. It seemed that Charlie ran out of control cable and tied his aileron control with a shoelace but it broke.

Nobody knew where the lightning was going to strike next as Denison Gallaudet said, and life was likely to be terminated suddenly, so why worry when you can't tell anything about it.

Arch and Donald Black began to argue about the Frenchman Eiffel and his ideas for testing wings in a wind tunnel, but nobody knew much about it.

"Let's go over to the 'Four Corners' and get a beer and some free lunch," said Worley. They all went.

Leo Stevens, the old balloonist, thought it would be a great idea to have a parachute in an airplane that the pilot could jump out with in case of trouble and Riley Scott proposed to have one packed in the tail of the plane and even made drawings of it and tried to sell the idea.

These hard boiled birds just laughed loud and long at the idea because, as a rule, they had all they could do to lift themselves and a little gas off the ground. So the mercurial but somewhat bibulous Riley went off to the big city to Shanleys and got tight to drown his disappointment at their ridicule.

(*Concluded on page* 80)

"Forced Landing", a Dramatic Picture

The Bedouins run toward the disabled ship while the worried pilot awaits them.

THIS dramatic photograph was taken in Egypt recently following a forced landing near an oasis in the Sahara desert. H. J. Fresco, one of the plane's two occupants, sent POPULAR AVIATION the photograph.

Because the desert tribes are so treacherous and bloodthirsty, the two men were somewhat nervous when a band of Bedouins were sighted running toward the airplane. "We were both armed," Mr. Fresco writes, "but it is bad policy to display guns until strictly necessary. This picture was taken a few minutes after the landing. I took it—just to steady my nerves."

A Japanese Warplane

THE photograph below is of one of Japan's latest fighting planes. This ship, a Kawanisi pursuit, is identical to many of the same type that are waging war against the Chinese today. Typical of the Japanese airplane, however, these warplanes are wreaking the great amount of destruction they are, only because they are faced with little or no resistance from the air. American-built Chinese warplanes, on the other hand, though they have had little part in the air-war so far, have proved themselves far superior to the Nipponese. Lone Chinese fighters have attacked whole flights of Japanese aircraft with telling effects, largely because of the superior performance and strength of the former's equipment.

Kawanisi fighters like the above make up a large part of Japan's present military air forces. These ships have proved inferior to American craft in China.

The Use of Slots and Flaps

by LIEUT. JOHN T. HAYWARD, USN.

American manufacturers have whole-heartedly adopted the airplane flap but have yet to take large-scale advantage of the widely-used British wing slots.

THE increase in power and the weight of the modern plane has naturally increased the landing speed. The discussion of the compromises that the design engineer has to arrive at in regard to weight and landing speed does not belong in this article. It is sufficient to say that the airplane of the future will probably be fitted with some form of high lift device and it appears desirable to examine the characteristics of high lift arrangements. It is essential that the pilot of the modern plane be thoroughly familiar with their operation and how to obtain the best results from their use.

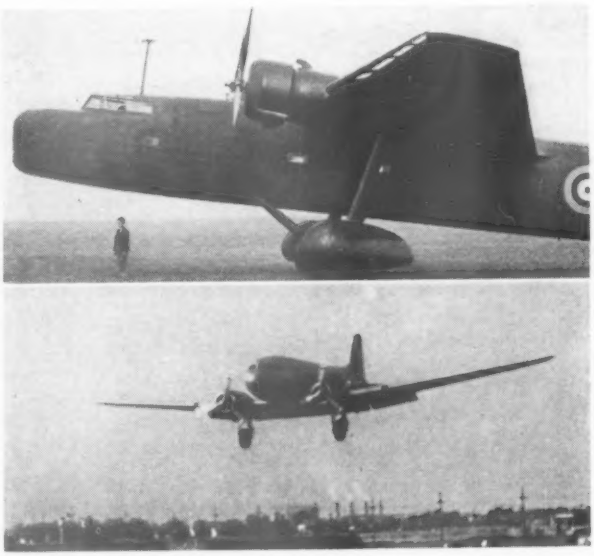
At present the types of high lift devices in use or under test are divided as follows:

1. Trailing edge flaps.
   (a) Plain or aileron type.
   (b) Slotted flap.
   (c) Split flap.
   (d) Zap flap.
2. External airfoil type.
3. Variable area. (Fowler)
4. Leading edge slots.
   (a) Movable slot. (Handley-Page)
   (b) Fixed slot.
5. Leading edge slot with trailing edge flap.

Each of the above types has its advantages and disadvantages and there is surprisingly little difference in the results that can be obtained with the various types.

The slotted wing constitutes an important device with regard to safety in flight and may rightfully be classed under control surfaces. This functions by a form of "boundary layer" control. This device consists essentially of a simple auxiliary airfoil hinged in such a manner that it normally fits snuggly against the leading edge of the wing, conforming to the general contour of the wing. However it can be moved, either manually or automatically, to a position in front of the wing, forming a slot. The introduction of this slot results in considerably increasing the angle of attack at which the burbling of the airflow will occur. This is done by the slot which causes the air impinging on the wing to modify its usual direction of flow and to more closely follow the wing contour at large angles of attack. The lift is greatly increased for angles of attack up to 25 or 30 degrees, and the profile drag is simultaneously decreased. This aids lateral control at high angles of attack and reduces the landing and takeoff run. It prevents the fatal spin at low altitudes which is the chief danger to the private flyer who has neither the time nor the money to keep his flying skill up to the rigid standards of the services. The slot may be employed on a flap but the principles involving its use is the same regardless of where it is used namely that of "boundary layer" control.

Aerodynamically the first three types of trailing edge flaps, function by a simultaneous increase in camber and in virtual angle of attack as the flap is lowered. Consequently, they give high lift at moderate angles of attack of the basic wing. The variable area wing of the Fowler type gives increase in area with the increase in camber and angle of attack.



Handley-Page (Harrow bomber in the top picture) has been using slots for years. The American Douglas has flaps only.

Slots alone are considered impractical, and it is almost necessary to use some form of trailing edge flap to give maximum lift at a reasonable angle of attack. This is so, for at any angle of attack below that for maximum lift on a plain wing, slots alone actually decrease the lift, they prevent the burbling of the airflow until about an angle of 29 degrees. The use of flaps with slots reduces by more than ten degrees the angle of attack required for a given lift.

Any of the high lift devices named will give a large increase in wing drag. Most of this drag is due to the induced drag. This increase in drag is advantageous in landing, but it is undesirable in takeoff. It definitely limits the increase in lift that can be used in take off to some function of the power loading. If it is a high powered plane, in general there will be sufficient excess thrust to compensate for a large increase in wing drag. The increase in drag will increase the takeoff run. The increase in lift will decrease the takeoff run. Obviously there is some compromise setting of the flaps in taking off that will combine to give the minimum takeoff run. This will vary with the power loading of the plane. The percentage of wing fitted with flaps has a marked effect on the flap angle for minimum take off run.

A deflected flap gives a marked increase in wing diving moment. Fortunately, this effect is about neutralized by the increased downwash on the tail. The change in longitudinal balance depends on this diving moment and how much of it is compensated by the increased downwash on the tail. This in turn depends on the location of the tail, tail area and center section design. This change of longitudinal balance with the use of flaps is an individual characteristic of each airplane design that must be determined by flight tests.

So far we have had a brief discussion on the types and characteristics of high lift devices but now we deal with the practical side of the problem, namely their operation on a plane under varying conditions. In general, the best results are obtained in take-off with flaps about one-third or one-half down, but the best flap setting is in the same category as the setting of an adjustable stabilizer since both involve similar exercises of judgment based on experience.

Certain precautions are necessary or advisable in using flaps on a take off. Flaps on low wing monoplanes or on the lower wing of a biplane are to be used with caution on rough ground to avoid damage from gravel thrown against them. Flaps should not be raised immediately after take off or at any other time when near the stalling speed as an appreciable interval of time may be required for speed and angle of attack to become adjusted to the new condition. The airplane should never be flown at high speeds with the flaps down. There is no reason for ever flying in excess of 120 miles an hour with the flaps full down. The reason for this is obvious.

There are fundamental considerations

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Glass Noses for Airplanes

This is the latest innovation in airline operations. The glass (composition, not true glass) nose can withstand heavy sledge-hammer blows without breaking.

PROBABLY the greatest problem to be solved in airline operations today is radio static. Great sums of money already have been spent by the nation's leading airlines in experimentation with loops, wires and other paraphernalia intended to dispel static so the pilot can use his radio equipment when it is most needed.

The most definite advance along this line recently has been the loop antenna and direction finder. The antenna and mounting shown in the above photograph happen to be the latest of recent developments. The loop antennae are installed in the above manner on Northwest Airlines' fleet of new Lockheed "14" transports, the first of which was only recently placed in service. According to the airline's engineers, this antenna greatly improves the efficiency of the loop antennae, largely because of the fact that Northwest's antenna is protected from ice, rain and snow inside its glass housing. Experts have found that ice gathers on the antenna itself and impairs reception greatly as does rain beating on the exposed loop. Some airlines believe they have remedied this by building their loop antenna within another loop. Northwest radio engineers, working with Lockheed radio men, believe the additional glass cover helps to insulate the loop itself against static generated by actual contact.

Another novel feature of Northwest's glass-nosed airliners is that a light has been installed in the transparent housing which is switched on during night flights. Many persons already have reported seeing Northwest's weird blue light fly past high overhead.

These new high-speed airliners (they are said to cruise at 225 m.p.h.) soon will be flying all Northwest's transcontinental trips.

Nancy Bird—Air Ace
by Clark S. Parker

WHEN at an early age, Miss Nancy Bird showed a keen interest in flying but it was not until she had become of age for a license (17) that she began her flying career.

At 17, Nancy Bird joined the Royal Aero Club, her first lessons coming from the late Air Commodore, Sir Charles Kingsford-Smith, who gave her some very valuable instruction in flying.

After completing her course, Nancy obtained her private license and soon after purchased a De Havilland *Puss Moth* in which she flew around Australia, gathering much flying experience.

Miss Bird has recently celebrated her twenty-second birthday (end of October, 1937) and is the possessor of an "A" and "B" commercial license, with over 500 hours to her credit. Although she has not been eligible to qualify for an engineer's certificate, Miss Bird has a ground engineer's license and is quite capable of administering minor repairs and can overhaul her engine in first class manner. Her present plane is a British D. H. *Leopard Moth* furnished with a Gipsy-six engine.

"Safety First" is the motto of this bright determined young Australian flyer who says she has no inclination to do any long distance flights or other such stunts.

Recently, Miss Bird completed a large contract for the "Far West Health Scheme," an institution in Australia organized to protect the health of the children out in the back blocks of New South Wales. This was indeed splendid work on her part as she was the first flying unit to operate a flying doctor service in the west.

Although the conditions in the west were far from being good, Miss Bird said she enjoyed flying for the Far West very much and found the work very interesting.

Her headquarters were at Bourke, a small town in the northwest of New South Wales. A small runway, a hangar and a few other accessories make up the aerodrome which is conveniently situated on the outskirts of the town. Flares, wireless, night-flying equipment, etc., which make up a modern airport are unheard of due to the fact that only a few planes use the 'drome weekly.

Although the ground out west is comparatively flat, it is covered with thick mulga scrub and together with red claypan makes landings very rough and difficult, especially after heavy rain when the 'drome and other landing places become muddy and boggy.

Known throughout the back blocks as "The Flying Angel of the West," Miss Bird's job was to carry a nurse hundreds of miles on inspection tours which lasted three or four days or fly to some far away station to pick up a sick pa-

(*Concluded on page* 84)

January's Gas Model—the "Cub"

by PAUL W. LINDBERG

POPULAR AVIATION Model Editor

This finished model of the Taylor "Cub" turned in some surprisingly excellent flights when being tested. Spar for spar it's built to scale, is inexpensive.

THE Taylor *Cub* is now one of the most popular sport planes in the air today. Its clean, simple lines make it very easy to construct. The long fuselage with a great amount of wing area has proven it to be an exceptionally stable flyer. The model when viewed in flight is hard to distinguish from the real airplane.

Many of the latest features have been developed in this model, such as a large cabin door for inspection of the batteries, removable cowl and hood as well as movable ailerons together with adjustable tail surfaces, and the wings shear off in case of bad landings. All these features make it an outstanding model in itself.

The wings may be taken off so that the model can be carried in the smallest amount of space.

Note: By increasing the plans five times the size shown in the magazine, your model will be the same size as our model of the Taylor *Cub*. This may be done with a pair of dividers and a draftsman's ruler.

Construction of Fuselage

Great care should be taken in constructing the fuselage. The main longerons are of basswood so as to withstand any severe shocks encountered in itself. The two uppermost longerons which work from the trailing edge of the cabin to the tail are of balsa. All other pieces are of balsa such as diagonals and uprights. Ordinary wax paper is placed over the plan so that the framework will not stick to it when constructed. When the two sides have been constructed, the cross members are cemented into position. Check from front to rear at this stage to make sure that the proper alignment is had. When the cemented joints have become thoroughly dry, one half inch No. 18 wire nails are driven through longerons and cross members of the fuselage. From ⅛ inch sheet balsa, cut the formers and cement in their proper locations.

The cabin is thoroughly braced so as to take any undue strain applied to it from the wings. It would be wise to study the plan carefully at this point so that it is clearly understood, before constructing same. A removable hatch is built in the rear part of cabin as well as a side door so that new batteries may be installed.

The firewall is made from 3/16 inch veneer and is attached securely to the front end of the fuselage. The photo of the framework clearly shows the piece of body which is covered with cardboard and aluminum. It is best to make patterns of these first in order that the proper fit may be had.

Construction of Landing Gear

After a great deal of experience on our part, we have found this landing gear to be the most practical and simplest to install. The landing gear consists of one piece of ⅛ inch spring tempered steel wire which forms the front axles of the wheels. It is important where the landing gear fastens to the fuselage that it be tied securely with heavy thread. The rear part of landing gear is of the same kind of wire but 1/16 inch in diameter. After this has been tied in with front part of landing gear the space is filled in with balsa. In order to prevent this piece of balsa from working loose, it is advisable to cover same with strips of bamboo paper and dope thoroughly.

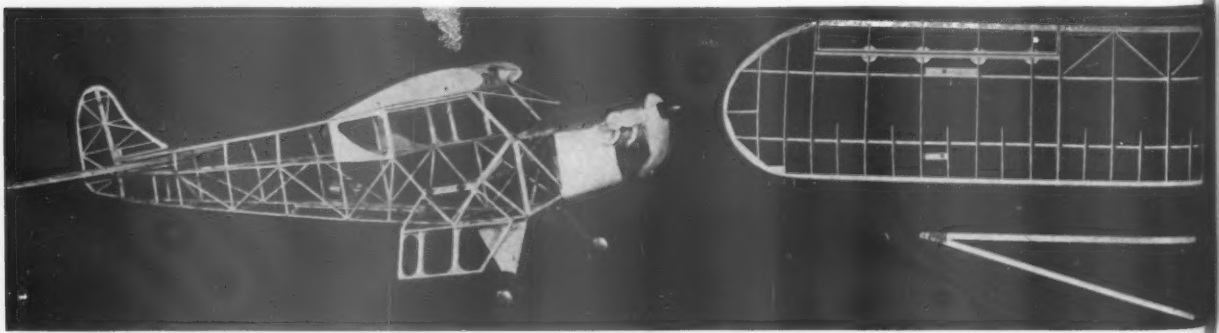
Construction of Elevator and Rudder

These are constructed upon a flat surface so that they will have no tendency to warp. All ribs and bracings in elevator and rudder are of 3/32 inch and 3/16 inch balsa strips. The outer edges are of 3/16 inch thick balsa. After the frameworks of each have become thoroughly dry, round off all edges with sand paper.

The elevator is adjustable by means of an adjustment screw located in the center of the leading edge. This unit is imbedded and cemented into the balsa so that it will not turn with the screw. A strip of aluminum is cemented over the top and around bottom as an added reinforcement. A lock nut is applied so as to hold the elevator in a fixed position after the proper setting is had. The rudder adjustment is very simple and is clearly explained in details found on the plans.

All ribs are cut from 3/32 inch sheet

(*Concluded on page* 68)

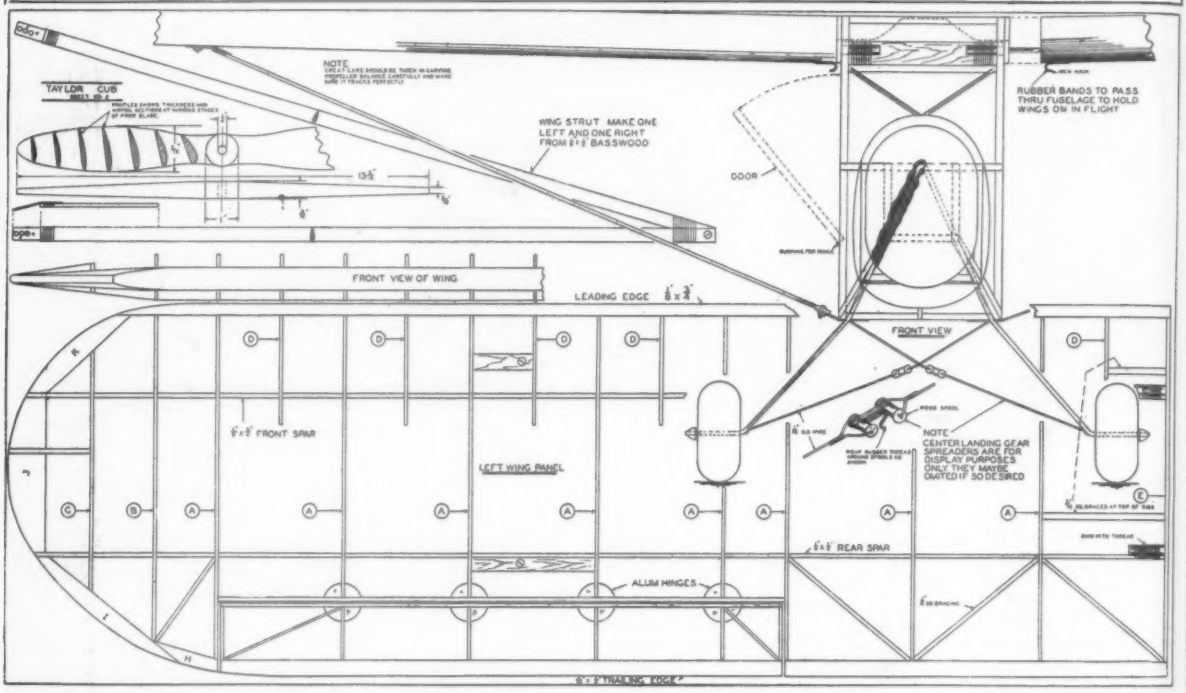


The "Cub" gas model is authentic even to the cabin door that can be seen hanging open on the left. Note the clean, rugged construction and the trimness of the engine mounting.

TAIL WHEEL FORK&SPRING TEMP STEEL WIRE
METHOD USED FOR RUDDER ADJUSTMENT
ELEVATOR ADJ.
ALUM
TEMPLATE FOR WINDSHIELD
TOP LONGERONS
TYPICAL FUSELAGE CONSTRUCTION
TEMPLATE FOR CABIN TOP
THIS SECTION CUT OUT
BATTERY HOLDER
SIDE VIEW
RED STRIPES
TO BALANCE MODEL MOVE BATTERIES
NOTE RUBBER BANDS TO HOLD BATTERIES IN PLACE
DOOR DETAILS
STRINGER IN TOP
TOP VIEW
SLOTS
GUSSETS
RIB 'F'
WING SET AT 1° INCIDENCE
SWITCH BLOCK
PLUG TYPE SWITCH
RIGHT WING PANEL
RIB 'E' SAME 'A' BUT ⅛" IN THICKNESS
BIND WITH THREAD
DUMMY CYLINDERS
CONTROL DETAILS
BALSA TRIM TABS BENT TWO WAYS TO SHOW LIFT CAMBER
SCALE 2½" = 1'-0"
TAYLOR CUB

Building the Taylor Cub

(*Continued from* Page 66)


TAYLOR CUB
WING STRUT MAKE ONE LEFT AND ONE RIGHT FROM 1/2 x 3 BASSWOOD
RUBBER BANDS TO PASS THRU FUSELAGE TO HOLD WINGS ON IN FLIGHT
DOOR
FRONT VIEW OF WING
LEADING EDGE 1/8 x 3/4
FRONT VIEW
1/8 x 3/4 FRONT SPAR
LEFT WING PANEL
NOTE CENTER LANDING GEAR SPREADERS ARE FOR DISPLAY PURPOSES ONLY THEY MAYBE OMITED IF SO DESIRED
1/8 x 3/4 REAR SPAR
ALUM HINGES
1/8 x 3/4 TRAILING EDGE

balsa. Spars, leading and trailing edge then are cemented into place. Do not omit any of the bracing between the ribs, as this is necessary to strengthen them. Five-sixteenth inch dowels are cemented to spars at the root of wings. Bind these with thread or string. The wings carry movable ailerons which are a great help when flying the model, as a small amount of wash-in is necessary to counteract propeller torque.

The entire model is covered with a good grade of bamboo paper. In applying the paper to the framework, ordinary model airplane dope will not do. Ordinary cement, thinned out slightly, makes excellent paper cement. In order to obtain a nice covering job, see that practically all wrinkles are removed.

Do not stretch the paper so tightly over the frame that it will have a tendency to pull out of shape. After the various parts have been covered, dope with water. This will cause the paper to tighten over the framework. If the brush is used, extra precautions should be taken so as not to tear the paper.

Any small spraying device is an excellent means of applying the water. After the pieces have become thoroughly dry, clear dope them. To obtain a smooth finish, a light sanding is given between each coat. To finish off the model, color coats are applied. Color used on this model is yellow trimmed in red stripes. It is best to keep the lacquer thin enough so that it will flow freely. This will require an extra coat, but the results obtained are well worth the extra effort.

Assembly

The utmost care is required in assembling the model. Do not become too overanxious to get your model into the air, as you might overlook some vital points which may prove very disastrous.

If the wings are not in exact alignment and are not square with the fuselage or if the angles of the two panels are not exactly the same, then the model will not fly properly and it will be difficult to control. Careful measurement should be made in checking up these points.

As you will note in plan, small iron hooks are cemented to the bottom of the spars next to the root ribs of the wings. These are necessary to receive the rubber bands which pass through fuselage to hold the wings in position.

Next, make sure that all connections are tight and that the power plant is amply secured upon the engine bed.

This model was successfully flown before the plans were given their final okay.

END

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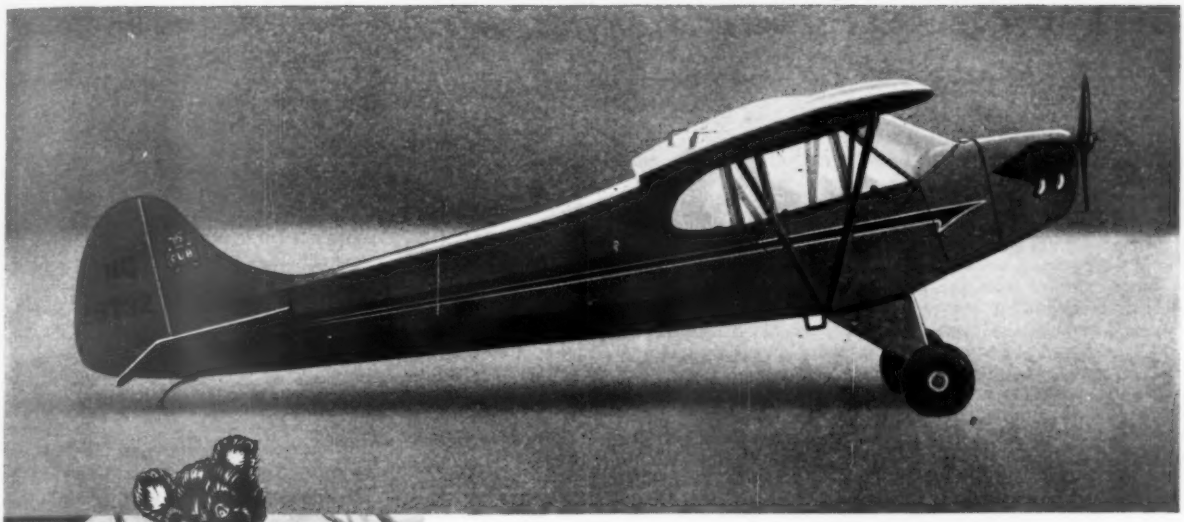

The new 1938 Cub Sport cabin—whipcord upholstered—is completely weather-tight. No drafts, rain or wind can detract from your flying comfort. Its new type window raises straight up and down for greater convenience. Seats are wider and deeper. All mechanism has been neatly housed providing a clean, clear floor with additional leg room.

Operation of the new 1938 Cub with dual controls has been made even more simple by the provision of a stabilizer crank with indicator and of conveniently located push-pull ignition switch and gasoline shutoff. A new type of quick-action safety belt comes as standard equipment. Other new features include a rear view mirror for even greater safety and a convenient step for getting in and out of the plane.

Announcing the New

1938 CUB SPORT

Here it is—the finest Cub ever built—a Cub that sparkles with new beauty, new comfort and new convenience! More than a score of brilliantly engineered refinements make this new 1938 addition to the Cub line the world's outstanding airplane value.

You will be delighted with the handsome new color combination available in this new 1938 Cub Sport with dual controls. And you'll like its newly appointed cabin, its deeper, wider, more comfortable seats, its additional leg room, its new stabilizer control, push-pull ignition switch, gasoline shut-off, streamlined fin and the new step that facilitates getting in and out.

LOOK AT THE PRICE – ONLY $1395

Yet, with all these advanced features, the price of the new 1938 Cub Sport is extremely low — only $1395 F.A.F. Lock Haven, Pa.! And you need pay but $465 down—the balance in easy monthly payments. The price of the 1938 Cub Trainer remains unchanged—$1270 F.A.F. Lock Haven, Pa. — $425 down. Get your 1938 Cub now! Ask your dealer for a free flight demonstration in this safe airplane.

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Send today for full particulars concerning the new 1938 Cub Sport, illustrated Cub folder and name of your Cub dealer. Use coupon at the right if you wish. Piper Aircraft Corp., 18 Aviation Street, Lock Haven, Pa.

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18 Aviation St., Lock Haven, Pa., U.S.A.

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CITY_____ STATE_____

COUNT THE CUBS

THE WORLD'S FASTEST SELLING AIRPLANE

Cadet Days at Randolph Field

(*Continued from Page 52*)

As I approach San Antonio I can see the split beacon lights on Brooks, Kelly and Randolph Field. They show up from the air as two quick flashes. Only army air fields use the split beacon as a distinguishing mark. The flood lights on Randolph show up clearly to the East of town so I head that way. About five miles from the field, I radio R.T. 5, giving my plane number, position, and request permission to land.

"Okay, Hays," he says, "go to number two zone and wait for instructions."

As I cross to my zone I notice a red circle of lights on one of the hangars which means that some of our permanent personnel or else a visiting ship is coming in to land—students stay in their zones. I see a plane land in the floods.

"R.T. 5 to 221. Okay, Hays, come on in and land." I glide down below 1,000 feet, leave my zone, come on in for a landing. Careful, remember the tendency is to level off too high. I glide down through the lights and ease back on the stick when it seems that I am flying into the ground. Okay. A good landing. And now up to the gas pits and the first N9-S flight is over. So well were these trips planned that nobody got lost and no ships were damaged. The second trip was Houston in the afternoon, then to Waco and back to Randolph after dark.

Two weeks before the class ends we get a taste of acrobatics in a ship which has had the gyro instruments removed. These sensitive gyros cost from $400 to $500 and a snap-roll can ruin one. The snap-roll can be done very nicely in a Nine, but I found that the nose has a tendency to drop below the horizon in a slow roll. The plane does a good loop and a poor Immelman. It seems to me that it takes more practice to do good acrobatics in the monoplane than it did on "A" stage in the biplane.

With our varied course we were kept so busy that the four months on Basic Stage were gone before we knew it. But one night, at dinner, we suddenly became aware that we were on the threshold of Kelly. It was the night that all the instructors were the guests of the upper class. After dinner the lower classmen put on a show which is traditional and is given by each lower class on the night before they become officially the new upper class.

This dinner is a momentous occasion and to miss it would be like missing the graduating ceremonies at college.

The dinner brought back memories of our dodo days. We started with 122 men. There was Marvin, whose assurance and wit covered a real fear of airplanes. There was Jackson, who knowing that he was due for elimination, turned in a ride that the stage commander will probably never forget as long as he lives. We remember the souse, whose brilliant flying on Thursday and Friday failed to compensate for the week-end hangover which extended through Monday, Tuesday and Wednesday. Fifty-five of us go to Kelly.

From here on out I expect to fly single-seat pursuit ships mostly. The flight report will read like this: Pilot—M. H. Hays. Co-pilot—God.

And I hope that it will not be necessary for God to fly the ship very much of the time.

END

The Butcher, The Baker . . .

(*Continued from Page 39*)

When a doctor is in a hurry, he's in a hurry.

Dr. H. G. Grovogel, Sturgeon Bay dentist, also soloed several weeks ago and is now preparing to take his flight and written examination before a federal inspector in an endeavor to obtain a pilot's license.

Like Reynolds, Dr. Dorchester and Dr. Grovogel, John Draeb, well-to-do jeweler, has been married for many years and he, too, is a parent with a deep sense of responsibility to his family and community,—belong to the Lions' Club, Chamber of Commerce and all that sort of thing. Unlike the others, however, he had had previous experience with aviation, having made his solo flight in Appleton years ago. Later, he purchased his own cabin plane but eventually disposed of it. When Hedeen came to Sturgeon Bay, Jack (as the jeweler is known throughout Door county) got a whiff of cylinder oil and promptly yielded to an uncontrollable urge to get back into the air. And that's where he now spends a large share of his leisure time.

Ed Allee, commercial fisherman; Fritz Stradling, confectioner and property owner; C. N. Kostka, automobile dealer; Virgil Starr, store executive; Harry Stradling, owner of two beauty shops; Robert Krauss, owner of a filling station; Lyman Houfek, resort employe; and J. Everett Oakes, commission house buyer,—they are some of the others who are helping to make Sturgeon Bay become the aviation capital of Wisconsin.

Time was when aviation was considered a young man's game,—when a flier was regarded as a superman or daredevil. But these Sturgeon Bay aviators belong to a different, to a finer breed. They are men of responsibility as well as men of vision. Few of them are mere youths for most of them are in their late thirties or forties. And none of them wants to fly the airmail or hop across the Atlantic. They're getting ready to build their own hangars, buy and operate their own planes because they're in aviation for the sheer fun of it,—not for glory or for profit.

That's all there is to it.

END

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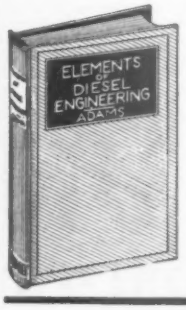

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Chicago

The Birdmen's Perch

Now that we come to think of E. L.'s letter, what DOES happen when a prop makes accidental mince-meat out of buzzards "on the wing?" If any of you cloud-hoppers have any first-hand information of just what happens when a bird flies into a prop, scribble a line quick, to:

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," *Mgr., Aviation Dept.*,
Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

CORRESPONDENCE WANTED FROM KANGAROO LAND

"I am anxious to strike up a correspondence with some one, under the age of twenty, keen on aviation, residing in U.S.A. who has pictures to trade.

I am interested in all first-hand activities concerning airplanes."

—Frank McEgan, 157 Murrumbeena Rd., Carnegie, S. E. 9, Melbourne, Australia

MAN VS. BIRD

"I'm a little touchy about having my veracity doubted—and I've gotten the 'bird' *twice!*

I can't tell exactly how the first one happened, because I was flying blind at the time, but I felt the sensation of a jerk and a hesitation of the motor—then everything kept on smoothly.

When I got down, I found eagle feathers stuck all around in open vents, etc. And Major, if there's any way of collecting eagle feathers two miles up in the air, outside of clipping an eagle with my prop, I don't know about it.

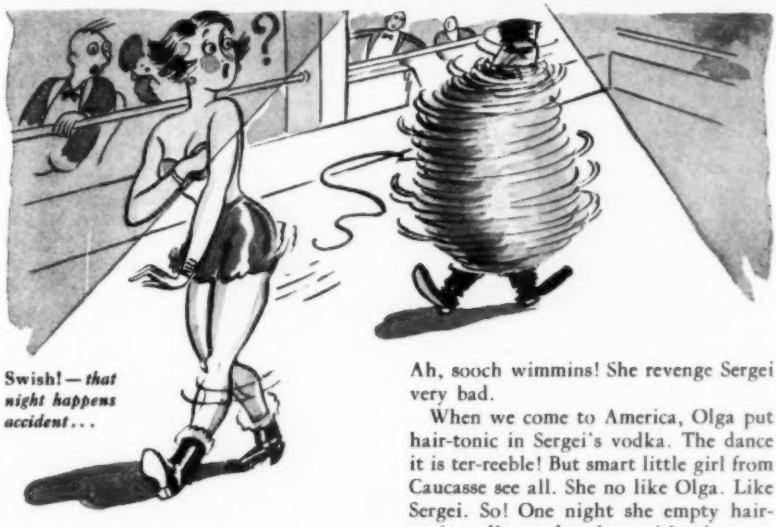
I got the second 'bird' because the boys

claimed *I* should have been mince-meat instead of the eagle. How about putting in a word for me?" **—E. L., Brooklyn, N. Y.**

ARE NAVIGATORS SMART?

"Tattered Wing-Tips" is neutral. But the following test of ingenuity promoted quite a squabble recently. Out of *five* flying gents, *one* never solved it at all, *three* solved it with pencil and paper, while one ingenious gent solved it in his head. "T. W-T" thought readers might like a whack at it—without pencil. Here goes:

A birdman, heading directly into the wind, passed a toy balloon just as he passed a church steeple. Fifteen minutes later he decided to take another look, turned, and headed with the wind, caught up to the balloon again 14 miles past the steeple. He had no instruments. What was the wind velocity?



Swish!—*that night happens accident...*

"T.W-T" will be glad to acknowledge queries as to the correct answer.

WINGS ON AUTOS

To get that airplane performance from your auto, just try *Gulf No-Nox Gasoline*. *Gulf No-Nox* sure *does* have what it takes to put "wings" on tired gas-buggies!

REFINED STORY DEPT.

Gulfpride Oil, made from 100% Pure Pennsylvania, is refined by the exclusive Alchlor Process that *continues* refining where other processes stop.

By actual tests the Alchlor Process eliminates as much as 20% additional black gummy waste! *Result: Gulfpride is the world's finest oil for planes!*

THIS MONTH'S WHOPPER

"I, Sergei, am great Rooshian dancer who hold world record for to jump, to keek and to spin, in famous ballet. I haf much troubles with ugly wife, Olga, but Gulf fix O.K.

Olga, who is dance partner, no like so much I dreenk the vodka before dance. But, Meestre Al, vodka make Sergei to dance fine! It make Sergei to spin like tops, to keek high, like so!

Sometimes Sergei feel so good when he spin he keek Olga in chin by purpose. Ah, sooch wimmins! She revenge Sergei very bad.

When we come to America, Olga put hair-tonic in Sergei's vodka. The dance it is ter-reeble! But smart little girl from Caucasse see all. She no like Olga. Like Sergei. So! One night she empty hair-tonic vodka, and replace with what you call the *Gulf Aviation Gas*.

Meestre Al, that night happens accident, I promise you! Sergei spin like aeroplanes propeller! I spin so fast I grab for somethings to stop. I catch only thread of dress of Olga—*Swish!*—and I am spool of thread while Olga is bare Rooshian baby! Poleece come, say "Ha! So a Bubble Dance it pulls!" and Olga ride off in droshky with siren.

So! Now Sergei dance with smart little partner from Caucasse. Both, we dreenk the *Gulf Aviation Gas*. She spin on top of Sergei's head, and Sergei spin in opposite direction with both feet in air at once. I am sensation!

But poleece come, say "Sergei, we haf take Olga by mistakes to monkey zoo, and now no one can tell from monkies. Come, pick out your Olga!" So, Meestre Al, Sergei go to zoo and pick out nice real chimpanzee. I no fool, eh?

Olga still in zoo, thanks *Gulf*, O.K.!—**L.C.**

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GULF **GULF AVIATION PRODUCTS**

Do You Know...

. . . THAT Pan American Airways System recently inaugurated faster schedules to Central and South America with a fleet of giant Douglas DC-3 high-altitude airliners powered by the latest type of Wright Cyclone engines.

. . . THAT these powerful Wright Cyclones, supercharged to fly at high altitudes over the snow-capped Sierras of Central America and towering Andes Mountains of South America—the loftiest mountain ranges of the Western Hemisphere—will reduce Pan American's flying time from the United States to Buenos Aires to four days—a saving of 24 hours under the old schedules.

. . . THAT Pan American's luxurious airliners now speed from Continent to Continent in an incredibly few hours—over routes which for centuries required endless months of surface travel—overcoming amazing barriers of distance and linking North America with romantic and colorful Latin America.

. . . THAT Wright Cyclone-powered Douglas DC-3 airliners are in operation on Pan American Airways' Western trunk route from Brownsville, Texas, to Cristobal, Panama via Mexico and Central America—also on Pan American Grace Airways to Guayaquil, Ecuador; Lima, Peru; Santiago, Chile, and over the Andes Mountains to Buenos Aires, Argentina, and Montevideo, Uruguay.

. . . THAT on the Eastern trunk route Cyclone-powered Douglas DC-3s connect with Pan American Clipper ships at Rio de Janeiro—saving 12 hours' travel to Buenos Aires.

. . . THAT Wright is proud of the part it has played in making possible the high-speed, dependable schedules of leading airlines of the United States—American Airlines, Braniff Airways, Eastern Air Lines, Pan American Airways, and Transcontinental & Western Air.

. . . THAT in foreign fields, Wright engines power such famous airlines as Australian National Airways, Ansett Airways, Pan American Airways System, KLM (Royal Dutch Airlines), KNILM (Dutch East Indies), Swiss Air Lines, and other leading airlines throughout the world.

. . . THAT Wright Cyclones power many millions of miles of dependable air transportation each year—far more than any other type of aircraft engine.

"Fly with Wright the World Over"

WRIGHT

AERONAUTICAL CORPORATION
PATERSON NEW JERSEY

A DIVISION OF CURTISS-WRIGHT CORPORATION

Roosevelt Field Murals

(*Continued from Page* 43)

made after that date will have to be omitted, unless the hangar is built larger.

The first days of airmail, of army and navy flights, and of the old "stunt" pilots are shown in the murals. The Goldbug Hotel, rendezvous of the early flyers, the Hawley and Post balloon and the first hangar to be built at Roosevelt, belonging to the Aeronautical Society, are other features of the Rhonie murals, which everyone interested in aviation and its origins in this country should see.

The Air Service Post plans to add to the pictorial history a large collection of interesting memorabilia of aviation, and if possible will arrange for an annual reunion of as many of the "early birds" as can be gathered together.

A distinguished committee of flyers, appointed by Colonel Charles Wayne Kerwood, Post commander and formerly of the Lafayette Escadrille, the Greek Air Corps and the French air forces fighting the Riffs in Africa, includes: Col. William A. Bishop; Clyde Pangborn; Capt. Johnnie Butler, R.F.C.; Commander Frank Hawks; Col. J. Carroll Cone, Assistant Director, Department of Air Commerce, Washington; Brig. Gen. G. C. Brant, Air Corps, U.S.A.; Col. Temple Joyce; Roger Q. Williams, N. Y.-Rome flyer; Capt. James G. Haizlip, former winner of the Bendix transcontinental air race; Col. Dean Ivan Lamb; Capt. Tracy Richardson, soldier of fortune; Major E. E. Aldrin, U.S.A.; James Warner Bellah, ex-R.F.C. flyer and noted author; Major Ernest Jones; Capt. Henry J. White; Lieut. Fred Becker, U.S.N.; Ray Brown, and many others.

It was from Roosevelt Field that many of the greatest flights in history started—from the takeoff of the "Spirit of St. Louis" with Charles Lindbergh at the controls, to the Admiral Byrd, Post and Gatty, and other trans-Atlantic and round-the-world flights. Many of these famous flyers whose records have kept America in the forefront in world aeronautics, are members of the Air Service Post.

Aline Rhonie is an interesting person aside from her painting—for she is widely known wherever flying men and women gather. With approximately 2,000 flying hours to her credit, she also is one of the youngest American girls to hold a commercial air transport pilot's license which she received about four years ago. To her flying credit is the record of being the first woman to fly solo from New York to Mexico, in 1934, but "Pat" is not interested in setting aviation records particularly. She considers flying her favorite sport and painting her work.

When Diego Rivera, noted mural artist was in New York a few years ago, Miss Rhonie studied plaster or fresco technique from him, and in return gave Rivera some instruction in what is known as tempora painting. It was to exchange some such data that caused her to get into her plane and fly from New York to Mexico—which flight also combined a honeymoon with "Pete" Brooks, and the setting of the first woman's solo flight to the Latin country. On this flight she and Mr. Brooks flew their respective planes in military formation, communicating with each other by various signals, and her Lambert Monocoupe leading the way southward.

At 12 years of age, in the Dalton School, Miss Rhonie began her art studies and life work. At 15 she went to art school in Colorado Springs and studied under Randall Davey, and at 20 worked with John Sloan in New York, working with charcoal, oil and tempora.

While working on her preliminary sketches in her studio she follows a day and night schedule which knows little limitation as to hours consumed. Flying is her relaxation, and her shining Luscombe *Phantom* is kept in readiness at North Beach or Roosevelt, depending upon the season of the year. She got her private pilot's license at twenty.

The three sections of the completed murals will be known as the "Early Birds," the "War Era" and "The Barnstorming Days." When her sketches for any particular group or section have been completed, Miss Rhonie flies to Roosevelt Field, and perched high on a scaffold, works on the fresco. This type of painting takes longer than oil and cannot be changed or revised when once put on, without cutting out an entire section of the wall plaster. This is the same medium used in Michaelangelo's Sistine Chapel ceiling—water color on wet plaster.

Before even beginning to paint, five coats of plaster must be placed on the walls and a portrait has to be sketched at least half a dozen times or more. The actual painting must be done with deftness and speed in order that the plaster will absorb the colors before it dries.

The selection of Roosevelt Field for such an air shrine, and the permanent nature of the Rhonie murals, would indicate clearly that there is little basis in fact for the reports current some time ago that the famous flying field was soon to be turned into a residential development. In the hearts of countless flying men and women there undoubtedly is a warm spot for the field and its associations, and the establishment of a permanent exhibit as a memorial to the historic figures and events that Roosevelt has known appears to many as a fitting gesture by the men of the Air Service Post of the Legion.

END

OFF FOR A BERMUDA WEEK END . . . *in a Sikorsky*

Leave Friday morning. Swim in Bermuda's blue waters that afternoon . . . and be back at your desk early Monday morning! Pan American's Sikorsky Flying Boat continues to ply the air lane to Bermuda and return...twice a week...month after month...with clock-like regularity. Like so many of the modern aircraft, it's an *all-United* product. Flying boat by Sikorsky, engines by Pratt & Whitney, propellers by Hamilton Standard . . . all divisions of *United Aircraft Corporation, Bridgeport and East Hartford, Connecticut.*

Streamlining

(*Continued from Page* 50)

designs are indicated in Sec. 12. The minimum drag of a submerged radiator will be about five percent of power output, which is low compared with the 25 percent of a radial engine.

Radial aircooled engines are streamlined according to their number of cylinders. Engines having few cylinders may use individual cowls; for engines with more than five cylinders a cowling ring will give lower resistance than any other design. For cutting down only resistance without improving the cooling of cylinders a narrow cowl ring, a Townend ring may be used. To reduce the drag of an engine to a minimum and to get the most efficient cooling, especially with twin-row engines, NACA cowling must be used, designed to let the air pass only between the fins of the cylinders. Secs. 13, 14 and 15 shows sketches of cowlings. Section 15 shows a cowl with hammered bulges for the rocker boxes and its diameter smaller than the diameter of the engine. It usually gives higher drag than a smooth cowl of larger diameter; sloping the protrusions into the slipstream of the propeller will improve the resistance.

One streamline problem that stumped scientists and has been clearly evaded is nature's streamlining. The well-known toroidal pocket left around a pole and the settling of snow on a car during snowdrift does not conform to the expectations. There is a space between the snowbank and the unit that has snowflakes circulating in a whirl as shown in Sec. 16. This phenomenon was found on ice deposit on streamline wires. (Sec. 17.) Therefore the ice formation on wings will show the circular gap or gaps as indicated in the sketches.

This scheme may be applied to streamlining of struts or wheels as shown in Sec. 18 and may be called "controlled turbulency".

Nature's streamlining was used in 1927 by one pilot in improving his racer. During a heavy downpour he flew his machine and noted where the rain water collected; there he placed balsa wood fillets and naturally had the fastest machine of that make.

All streamlining is done in order to improve the performance of an airplane and it is often (but wrongly) mentioned that the only improvements made during 20 years was streamlining the Wright brothers' machine.

With utmost streamlining the final outcome will be an all-wing airplane consisting of one airfoil, landing gear retracted, engine concealed and every space within utilized for payload.

END

1938 AIR TRAILS ANNUAL

1. THE FLIER'S DICTIONARY
2. HISTORY of MAN IN THE AIR
3. THIS WINGED WORLD
4. SPLIT-SECOND ACTION
5. AIR TRAILS GALLERY

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Radio

(*Continued from Page* 14)

The output of the receiver is 700 milliwatts, which is sufficient to operate as many as six pairs of headphones simultaneously if desired. It is so designed that crystal-controlled reception in either or both of the high frequency bands may be employed, and for this purpose a two-frequency crystal control unit is available to be incorporated in the receiver. One of the crystals may be used in each of the high-frequency bands, or both may be employed in the same band. The definite day and night frequencies for communications between commercial planes and ground stations make this a desirable feature.

A device known as the "varistor" reduces loud static crashes when receiving weak signals, and the automatic volume control is normally used except for beacon reception, where it might interfere with the performance of the receiver for course indication.

The convenient facilities for transferring from one to another of the four frequency bands available, combined with its other features, make this receiver particularly well adapted for Marine applications as well as for the use of police and other municipal, county, state and federal agencies. In aviation service, its utility is not confined to the privately operated plane, but it is also well suited for emergency service in transport and mail planes.

Including its complement of vacuum tubes, the receiver weighs only 14¾ pounds and measures only 9 inches high, 14⅝ inches wide and 8¼ inches deep. The unit has been constructed to withstand the rigorous conditions of flying and includes a spot-welded chassis as well as special shock-absorbing rubber mountings.

END

Eating Time

(*Continued from Page* 34)

dered his salad cup and called for the chicken. I have never seen a man eat as slowly or deliberately. He chewed each bite until it must have been digested before he swallowed it. The Niagara river slipped beneath us and Buffalo faded into the distance before he finally had reduced the fowl to a heap of barren bones and accepted his dessert—cake and ice cream.

"We were just over Elmira when he finished the last of the dessert and called me again. Handing me his map he asked me to check our position again. I did so and he asked me to sign it. By this time my feminine curiosity finally triumphed, and I had to ask 'How come?'

"He explained, with a sheepish grin, that a friend of his had made the same flight and was bragging about a meal 275 miles long. This meal, he estimated, had lasted more than 450 miles and would effectively stop any further bragging on the part of his pal.

"I signed his map without further comment."

END

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BIG PLANE COLORS
BIG PLANE APPEARANCE. .

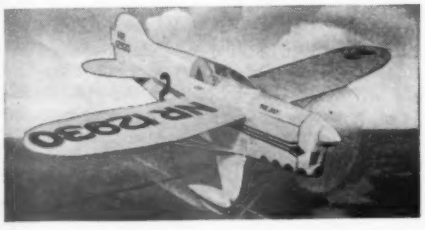
Get These Approved Gas Model Kits

EACH A RECORD BREAKER!

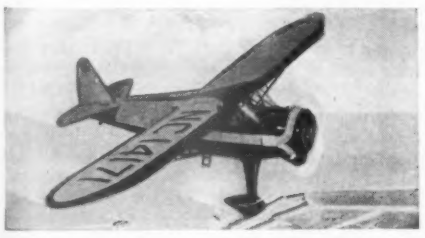
CUSTOM BUILT KITS TO MEET THE APPROVAL OF PARTICULAR MODEL BUILDERS. NO HURRIED PIECE-WORK. EACH KIT COMPLETE WITH A SELECTED GRADE OF MATERIAL.

IMPORTANT NOTE!
These kits are ABSOLUTELY COMPLETE, except for motor. Get any one of them and eliminate the necessity of having to buy a lot of extra parts. Each kit contains: all movable controls, ready formed landing gear, and motor mount, spun alum. cowls—where necessary, FULL SIZE BLUE PRINTS, license numbers and authentic markings, sheet aluminum, semi-finished wheel pants on models shown, leading and trailing edges tapered to shape on tapered wing models, all liquids (including colors), switches, bolts, screws, etc., and the majority of curved parts cut to shape; such as ribs, forms, wing-tips, etc. Such completeness will enable you to build a *finer* gas model.

New TAYLOR CUB
Span, 79½" Length, 50"
Our most recent flight sensation. A beauty, in yellow with red trim. Complete kit, including M & M Air Wheels, a real buy at..... **$8.50**

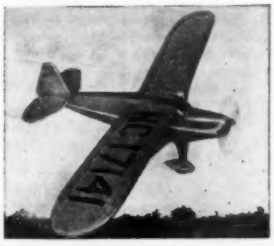


ART CHESTER'S (Jeep)
Span, 71½" Length, 56½"
An ideal flying gas model of Art Chester's classy racer in cream with dark green trim. Complete kit, including M & M Air Wheels, for only **$12.00**



HOWARD D. G. A.-8
Approved by Ben. O. Howard
Span, 6'4" Length, 51"
A great gas model of a great flyer, in a rich orange and black combination. Complete kit, including M & M Air Wheels, can't be beat at this price..... **$12.50**

The SILVER FLYER
Span, 6' Length 3'6"
A trim single seater pursuit job. Complete kit, with balsa air wheels. Only..... **$6.50**



The REARWIN Speedster
Span, 6' Length, 3'6"
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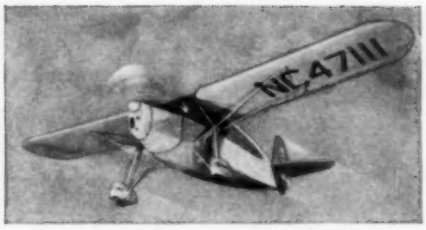

FAIRCHILD DELUXE RANGER "24"
Approved by Fairchild Aircraft Corp.
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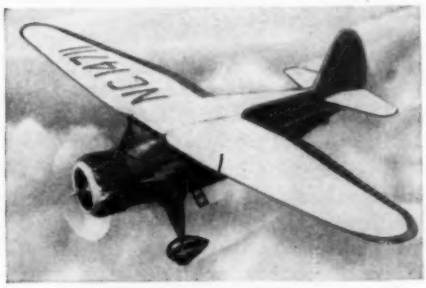
Excellent flyer. Plenty of wing surface gives it a wonderful gliding angle. Gray with red trim. A truly outstanding kit, including M & M Air Wheels. Price..... **$10.00**



The STINSON RELIANT
Approved by the Stinson Aircraft Corp.
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Span, 57" Length, 48"
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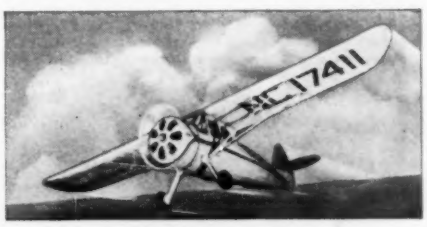

The LUSCOMBE PHANTOM
Approved by the Luscombe Airplane Corp.
Span, 6'4" Length, 51"
All the latest improvements tend to make this an outstanding flyer. Yellow with red trim gives it a striking appearance. Price, including M & M Air Wheels, only.... **$14.00**

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HOWARD D.G.A.-8 ☐	SILVER FLYER ☐
REARWIN SPEEDSTER ☐	U. S. ARMY PURSUIT ☐
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Note: If M & M Air Wheels are not desired, deduct 75c from cost of kit. West of Mississippi, and Canada, add 10%, Foreign 15%. Add 50c to cover mailing costs on each kit.

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The Story of Burgess

(*Continued from Page 46*)

ered with a 220 h.p. *twenty-cylinder* Anzani air-cooled engine and at that time it was the most powerful airplane in the United States. It was first demonstrated and flown by that famous old imer, Frank Coffyn.

Over in England for several years prior to this time, a Lieutenant Dunne of the British Army had been experimenting with a flying machine which would have absolute stability. He worked to the end that a plane would keep its proper balance regardless of sudden gusts of win. By using an entirely different system of controls and balance surfaces, he was able to bring this about. The Dunne design, unlike that of the conventional airplane, incorporated no fuselage and tail surfaces in the ordinary sense of the word. It was steered and given both lateral and longitudinal balance by the use of one set of ailerons alone. The wings of the Dunne plane had a sweep-back of some 30 degrees, these wings being characterized by a gradually decreasing angle of incidence. Large vertical panels were placed at the extreme wing tips and as has been noted, all auxiliary control surfaces were eliminated. This design was successful to the extent that it provided perfect longitudinal and lateral stability under any and all conditions.

Early in 1913, Burgess became interested in the Dunne design and that same year he secured the American manufacturing rights. Then early in 1914, the first Burgess-Dunne machine—a single float seaplane—was completed and successfully demonstrated. This marked the first time that the Dunne principle had ever been applied to seaplane design and it proved its worth by being the fastest and most rapidly climbing seaplane in the world. This first Burgess-Dunne machine was a pusher powered with a 90 h.p. water-cooled Curtiss engine.

The great inherent stability of this craft so impressed Army and Navy officials that several machines were ordered at once for both services. In addition to this, many planes of this design were built and delivered to the Italian, Canadian and Russian governments. From 1914 to 1916 a great variety of Burgess-Dunne machines—both land and seaplane types—were brought out. These included trainers, observation jobs, fighters, and patrol types. The various motors used in these craft included the 120 h.p. Salmson; the 150 h.p. Hispano-Suiza; the 140 h.p. Sturtevant; the Curtiss OX of 90 h.p.; the Curtiss OXX of 110 h.p., and the 180 h.p. Curtiss VX.

With the beginning of the war in Europe in 1914 there was a great demand for military aircraft and, with the growth of importance of military aviation, England sent a board of experts to this country to see if our manufacturers could supplement her own supply of fighting craft. With an eye to a rich English contract, the Burgess organization designed, built, and fully tested a pusher military biplane in the very short time of 21 days. The craft passed all acceptance tests and was ordered in quantity. Within two weeks after the completion of the first machine, a production of three planes a week was reached and maintained during the production of the entire order. This particular Burgess job looked something like a cross between a Vickers Gun Bus and a Farman, with its short nacelle and its tail surfaces mounted out to the rear on outriggers. An unequal span biplane type, it was fitted with a large balanced rudder. Large radiators were mounted on either side of nacelle. It is interesting to note that this particular craft was the first American built military job shipped to Europe for the Big Scrap. At this same time, a number of Burgess seaplanes were delivered to the Canadian government for training purposes.

By late in 1915, the U. S. Navy had decided to rapidly develop and enlarge its aerial arm and early in 1916 the Model S seaplane had passed the tests for training seaplanes and was ordered by the Navy. This job was a tandem seat affair with a fuselage similar to the Curtiss JN4D and it was fitted with the 120 h.p. Hall-Scott engine. Within a short time this craft was modified into a model known as the Type U, a single float machine using the Curtiss OXX 110 h.p. engine. Slightly

modified, the Type U appeared as the U-2 Trainer. This unequal span biplane was fitted with a large balanced rudder as well as with fins on the top wing and gaining a reputation as a highly developed training job it was used in quantities at the Navy's eastern flying stations. The U-2 was mounted on a single float (a flat bottomed affair) and it was equipped with rather large wing tip pontoons. Exhaust gases were carried up over the top wing by a long stack and a large transparent section was fitted around the cockpits. This transparent section allowed a wide downward vision.

About this same time, the Model L trainer was developed. A two-place, unequal span biplane, it was mounted on twin pontoons and had a big balanced rudder. Like many planes of that period, it was provided with an abundance of struts and rigging.

In 1917 Burgess brought out his Scout A and his Scout B to meet the government specifications for a seaplane-scout to be powered with a 100 h.p. motor and capable of attaining a high speed of at least 95 m.p.h. Although both ships met the specifications, the Scout B was selected by the Navy and ordered in quantity. Mounted on twin floats and with a rather large pontoon fitted under the tail, this machine was unusual in that all the usual struts and wire bracing were completely eliminated.

Following this the N-9, a single float job with generous control surfaces and fins on the top wings was produced, followed shortly by the N-9-H. This last-named craft went into immediate production for the Navy. Powered with a Hispano-Suiza, it was rated as being the best ship of its type then being built. In addition to being used as an elementary trainer, it was used extensively as a trainer in preliminary gunnery work.

With the entry of this country into the World War, the United States Navy began the development and expansion of its blimp outfits for reconnaissance and general patrol duty. Large numbers of them were built and the Burgess organization was given a contract to design and build cars for the non-rigids. These cars, as finally developed by Burgess, were large affairs mounting a 150 h.p. Hispano-Suiza out to either side on outriggers. Three large cockpits were provided for a crew of six and the car was equipped with bomb racks and a two-way radio outfit. A rather complete set of instruments were fitted in these cars, including water ballast gauges, gas pressure manometers, barometers, air speed indicators, bomb sighting apparatus, and compasses.

In the early spring of 1916, the Curtiss Aeroplane and Motor Corporation acquired the stock of the Burgess concern. For the next two years the Burgess plant was operated as a separate unit, but in the early months of 1919 it was completely absorbed by the Curtiss organization. Thus it was that the Burgess concern lost its identity and Burgess planes ceased to be a factor in American aviation.

END

Rigid Metal Dirigible

(*Continued from Page 54*)

from this source to a reasonable figure in contrast.

The day of the fabric rigids is apparently over for, when large metalclads are in operation, it will be realized that the danger of a puncture or a bursting gas cell is eminently less than in an airship equipped with delicately thin fabric cells.

In other words, if the future of commercial airships held no greater promise than the enclosing of the precious helium in perishable fabric little thicker than a man's pocket handkerchief then we might just as well give up.

Obviously, then, the only answer to this dilemma will be the metal-clad airship. This already has been proved a success.

However when large metalclads are flying then the truly commercial airship will have arrived. Men will pause in memory of David Schwartz for it was he who planned and built the first metal-clad airship. One cannot dispute a fact.

END

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Sunny Spain—a Bloody Proving Ground

(*Continued from Page* 12)

against air assault and military experts are scheming devices that might prove to be of much defensive value.

In this regard, the military defensive technique has developed quite as rapidly as the airplane. At the present time no military device can be used as a sure defense against attack by modern bombers and super air squadrons.

In the event of war in Europe, each country will become one vast network, listening in by means of a highly technical device known as "mechanical ears" while searching the sky with powerful lights.

The "mechanical ears" are ready to pick up and amplify the faintest sound from a hostile plane coming to work its job. The searchlights, projected miles up in the sky, will reveal any moving and flying object and make the anti-aircraft guns ready to shoot.

The principal defense against attack from the air is a well organized home airforce, swift and speedy, prepared to take off instantly when the ground-intelligence picks up signs of approaching enemy planes. This powerful defensive home aircraft, always ready to fly, will meet the enemy and engage him in combat before he can release his bombs.

Foreign military observers in Spain have noted with surprise the effectiveness of the German anti-aircraft batteries in General Franco's rebel forces. These ground guns have time and time again saved the rebel troops from defeat.

The German anti-aircraft guns have equipment similar to that of the present-day American and British anti-aircraft batteries. It is an apparatus that electrically calculates the speed and direction of oncoming hostile airplanes, and which sights and fires the guns.

Up to the time of the bombing and destruction of Guernica, old capital of the Basque province in northern Spain, the city had only one anti-aircraft gun for its defense against air raids—not one battery but just one old gun, quite out of date and always breaking down.

Military observers believe that if Guernica had five or six modern anti-aircraft guns, this ground defense might have kept the German bombers at a considerable altitude so that they would have worked less damage. They would have, at least, prevented the Nazi Junkers and Heinkels from swooping down and machine-gunning the civilian population, and it has been the machine-gunning from these German planes that has caused most casualties among women and children.

There has been a considerable pressure brought to bear, especially by the public opinion of the democratic countries, that the Popular Front government in Spain should retaliate for the destruction of Guernica and the burning of the cities of Bilbao and Eibar at the hands of the German aviators. The government flyers could easily bomb Seville, Salamanca or Burgos or any other large city occupied by the insurgents, drop bombs and then run.

Yet despite the provocation of ruthlessness and the inhuman cruelties of foreign aviators serving under rebel leader General Franco, the Spanish government does not attack civilians and endeavors to avoid unnecessary destruction of life and property. The secret of the present civil war in Spain is hidden in this distinction of policies and attitude between insurgent General Franco and the Loyal Spanish government.

The rebel planes purposely bomb busy streets where people gather, the parks, and market places where the non-combatant population congregates They know that bombing in purely civilian areas is safe. The whole shopping district and residential areas in Madrid, Aragon, Teruel, University City and Valladolid have been blown to pieces.

No Basque, no Madrilenos, no decent-thinking Spaniards will forget or forgive General Franco's wholesale butchering of the civilian population as in the Guernica massacre. Doubtless he knows this well but does not care. The loyal Spaniards will continue to fight for their government against the domination of alien dictatorship and tyranny.

The Spanish government officials and leaders expect to rule all of Spain. They have no desire to create hatred or rancor among the populace. They feel that the whole Spanish people are their people. So Loyalist aviators are instructed not to drop bombs in cities and towns except on the rebel trenches and fortifications.

The Loyalists seem to be content with checkmating the enemy planes and defending the territory. But, if the Rus-

(*Continued on Page* 80)

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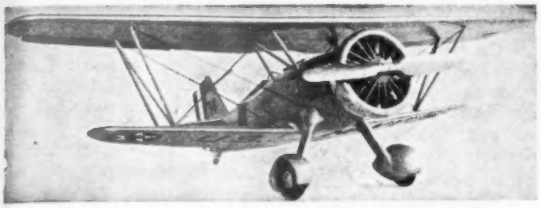
NEW CURTISS F11C4 NAVY PURSUIT



28" Span. Length 20½". Weight 4 oz. 1" Scale

THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD
A special De Luxe model, one of the most beautiful and finely detailed ever made, with its special exact scale 3⅜" celluloid. 1000 H.P. type, Wright Cyclone motor, having aluminum push rods, cylinder fins, etc., like real motor. Also in set are 4" aluminum cowl ring, 9" carved spruuce semi-scale flying propeller, colored star and rudder insignia, 2" celluloid balloon wheels, silver dope, paint, black, red striping, Navy lettering, wire parts formed, axles, rubber motor, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheel pants, etc. All other parts printed on balsa. Detail scale drawing. **Construction Set complete, postpaid..... $4.50**
Model ready built as shown.....$22.00

41" LOCKHEED ARMY SPEED VEGA

41" Span. Length 28". Weight 8 oz. 1" Scale

This new model, built very strong yet light in weight, is practically crashproof and will out-perform any large scale model built. Rises from ground in 10 feet and flies over 650 feet. Set contains all parts printed on balsa, ready cut pant cores, 4¼" turned motor front, 11" steel type carved paulownia wood propeller, 2½" balsa wheels, tail wheel, formed wire parts, 26" rubber, 3 oz. yellow dope, 2 oz. blue, ½ oz. black, 2 oz. glue, cement covering, full size scale drawing, and all parts. **Construction Set complete, postpaid..... $4.95**
Model ready built as shown.....$25.00

NEW NORTHROP A-17 ARMY ATTACK

24" Span. Length 17". Weight 2¼ oz. ½" Scale
Color yellow and blue
A new scale model of one of the 125 Northrops ordered for the U. S. Army. Set contains all parts printed on balsa, turned motor front, 7" carved propeller, insignia, wheels, set of colored dope, glue, and all parts. **Const. set in labeled box, postpaid..... $2.50**

Brown Jr. 1/5 H.P.

Long life motor with steel cylinder and piston for models of 5 to 8-foot span. ⅜" bore. 1" stroke. Complete as shown in illustration, ready to run. **Price..... $21.50**

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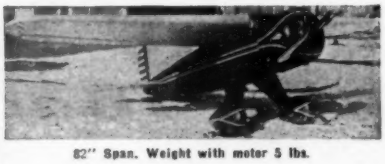

82" Span. Weight with motor 5 lbs.

Set contains formers, ribs, tips, pants, etc., all ready cut to shape, 8¾" turned motor front, 4½" rubber tired air wheels, silk covering, glue, and full sized drawing. This is a dry set without liquids. **Price set, f.o.b. N.Y..... $17.50**
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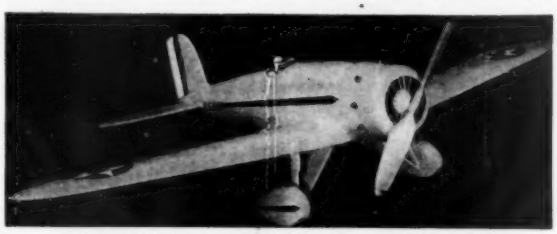
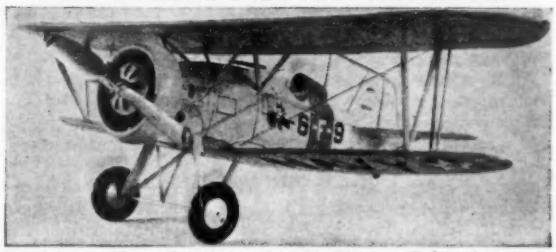
NEW LOCKHEED P23A NAVY FIGHTER



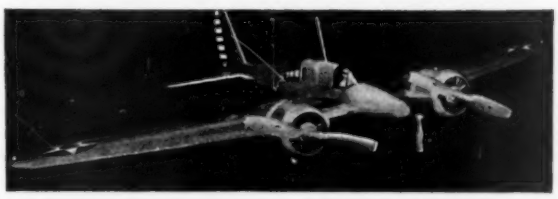
COMBINATION LAND AND SEA PLANE SET
32" Span. Length 20½". Weight 3½ oz. ¾" Scale
New 4-gun Navy fighter. Model will rise from land or water in few feet. Construction set contains fuselage and pontoon formers, wing ribs, tips, etc., printed on balsa, a 3⅜" turned cowl front, 2 instrument boards, colored insignia, lettering, windshields, 9" carved scale flying prop shown, 3 oz. silver paint, 1 oz. cement, ½ oz. black, 2 oz. glue, ready cut wheel pants, strong 2" aluminum wheels, 12 feet of rubber, and large 33"x44" drawing of land and sea plane. This is a sensational model and only one of its type in the world. **Construction Set in labeled gift box, postpaid..... $2.95**
Model ready built as shown.....$20.00

NEW BOEING F4B4 NAVY FIGHTER



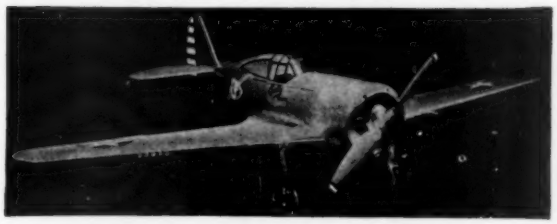
22½" Span. Length 14½". Weight 2½ oz. Color, Grey, etc.
This is the finest equipped Boeing, F4B4 model in the world. New improved model exclusively equipped with new 3¼" special aluminum streamline tapered cowl ring, 9 cylinder celluloid motor with aluminum ventilator front, 8" carved varnished steel type propeller, printed out balsa wood parts, 2 oz. grey dope, ½ oz. yellow, ½ oz. red, paper cement, glue, formed wire parts, celluloid wheels, tail wheel, U. S. Navy lettering, colored insignia, and ¾" scale drawing. **Construction Set complete, postpaid..... $2.95**
Model ready built as shown.....$20.00

NEW CURTISS Y1A-18 ARMY ATTACK



38" Span. Length 26". Color yellow and blue
This new twin motor model has lots of reserve power on its two 8" props and flies very well. Set as all parts printed on balsa, colored paints, glue, etc., full size scale drawing, two 3" turned balsa motor fronts, wheels, two 8" steel type carved props, etc. **Const. set, postpaid..... $4.50**

NEW CURTISS ARMY HAWK 75 or P36



37" Span. Length 27". Weight 5½ oz. 1" Scale
The U. S. Army has ordered 210 of this latest pursuit ship. Const. set has all parts printed on balsa, 10" steel type carved prop, 4" turned balsa motor front, insignia, 3 oz. silver dope, 2 oz. glue, etc., and full size scale drawing. A big powerful-looking model. **Set postpaid..... $3.25**

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Spain

(*Continued from Page 78*)

sian and French aviators see a good opportunity to fight Germans and Italians up in the air, they do so with a relish.

The Spanish insurgents hold a greater part of the area in Spain but the Loyalists control some 70 percent of the entire population.

Mussolini's whole-hearted support of General Franco not only consists of machine-power but also generous manpower as well. The recent report of the nine-power Non-Intervention Committee estimated some 250,000 Italian soldiers in General Franco's forces. This vast Italian enlistment, together with 200,000 Moors from Spanish African Morocco and the Legionnaires, constitute 95 percent of the entire force of the Spanish rebels.

If insurgent General Franco emerges victorious, it will have to be with the aid of foreign bombs, foreign bayonets and foreign soldiers. The Catholic church, the Spanish aristocracy and the rich are behind General Franco and backing up the insurgent's cause 100 percent, while the Spanish proletariat are the sole backbone of the government.

Foreign soldiers, chiefly British, French, American and Russian enlisted in the Loyalist forces do not exceed 10,000 and this is a very liberal estimate, according to the Non-Intervention Committee's report.

Politically, Mussolini's and Hitler's support of General Franco is based upon the desire of these two dictators to establish fascist-nazi rule in Spain so that the balance of power in Europe, as they claim, will be maintained. An alliance with Franco will accomplish the trick.

But, aside from political considerations, the economic reason seems to be an important factor why Il Duce and the Reichsfuehrer are backing up General Franco's cause. Germany stands to gain a good deal if Franco wins the war, for Spain would be an open market for German export trade and would also yield Germany access to precious raw materials which she needs sorely at home. And, possibly, if Franco would feel generous, he might give Spanish Morocco to Hitler, a country rich in minerals and natural resources.

As for Mussolini, besides trade opportunities in Spain in the event that Franco wins, Il Duce wants the Balearic Islands located east of the Spanish peninsula for Italy's naval and air bases. This is a secret dream nourished by the Italian dictator to insure and fortify Italy's control over the Mediterranean.

The Italian adventure in Spain is much more important and vital to Mussolini than to Hitler for Italy is tied to Spain. In case of Franco's defeat, Germany can get out of Spain without serious embarrassment whereas Italy cannot. Germany has no vast army in Spain.

The German aviators and technicians that are not captured or killed can fly their ships back to Germany. Italy cannot easily bring her vast army in Spain back home without serious handicap. This is a problem that worries the Italian leaders.

The nine-power Non-Intervention Committees demand that Mussolini withdraw Italian soldiers from the Spanish rebel camps is not meeting with success. European diplomats believe that Mussolini will not withdraw Italy's troops from Spain this month or even six or ten months hence.

So now it appears that the British and French efforts to whip Mussolini into line and make him acceed to the Non-Intervention Committee's plan seem futile. Mussolini's antagonism is strengthened by Hitler's unqualified support of Il Duce's Spanish policy and attitude. Reliable sources indicate that war implements and supplies such as tanks, machine-guns and planes are leaving Italy for the Spanish rebel forces in large numbers for Mussolini wants General Franco to prosecute the war to the bitter end and come what may!

And as this is written, it looks as though ruthless and inhuman destruction of life and property will continue in that death-ridden country, and *the airplane as an instrument of a new technique, produced and developed by modern science of war, will continue to spread terror, frightfulness, devastation and death in sunny, bloody Spain.*

END

Hempstead

(*Continued from Page 63*)

You see, Riley was a former Army officer and naturally interested in military matters. He was the only one who thought about war. But even Riley didn't expect one. He was far too sociable a fellow to want to fight with anybody. Riley invented a bombsight, and went to France and won a hundred thousand francs in a bomb dropping contest held by the French government.

But where are these men today, these hardy but happy pioneers? They have been scattered far and wide. Cliff Hadley owns an antique furniture business in Reading, Pa., and is doing very nicely.

Charles F. Willard was last heard of in Los Angeles. The Henrichs probably still live on Long Island where they were florists originally. J. V. Martin was living at Garden City, L. I., recently.

Arthur Stone is an aircraft inspector for the United States government at the Douglas plant in California. Charlie Kirkman is still building engines and planes at Farmingdale, Long Island.

Clifford B. Harmon lives in Paris and is head of the International League of Aviators. The Gallaudets have lost their fortune and Bert Acosta isn't doing so well. Rausie lives in Springfield, Ohio.

J. V. Martin was smart. He was commonly known as "Pink Whiskers," but J. V. could fly and he was full of ideas. He has patents on a great many features used today on airplanes.

J. V. built the first tractor biplane in this country at the Queens Airplane plant.

Leonard Bonney flew many a plane in those days at the Old Mineola Field. Leonard years later was killed flying an experimental all-metal full wing monoplane of his own design. J. B. R. Verplanck was rich and lived on the upper Hudson near Poughkeepsie. He also had a Curtiss F boat which he flew a lot.

Yes, verily, these were men. They wrote their saga in the air despite ridicule and disaster. They were truly sportsmen for, by large, there was nothing in its except disappointment in so far as financial return was concerned.

END

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. . . Swanee Taylor

(*Continued from Page 30*)

someone in the Industry has to undergo another expensive "investigation," the cost of which is not deductable under the aircraft procurement acts, or the income tax laws.

(*Aside to the Hon. Edward A. Kenney of New Jersey:* That bosh about the mythical "Air Trust" which you had read into the *Congressional Record* comes dangerously close to the latter of the above mentioned possibilities. Sounds like you might have had your leg pulled just a little bit. However, I'll be glad to set you straight on this "Trust" twaddle whenever you are ready to hear the unvarnished truth.)

Anyhow, the time has arrived for all good airmen and women to come to the aid of the cause. A letter—just a few moments of your precious time—written to your congressmen will acquaint them with the seriousness of aviation affairs in this country. And, believe it or not, congressmen would just as soon hear from upright, sensible people as from the army of connivers and crackpots they are forced to listen to day in and day out.

So, if your love of flying is genuine, if you have arrived at where you can't tolerate seeing the greatest potential boon to mankind further retarded by ignorance, if you are sick of seeing human life needlessly snuffed out, if you have the guts and energy to speak your mind, then, by all that is holy, sit down and write a few letters. But don't be sore-headed about it; write cooly, sanely and in a respectful tone.

For my part, I'll do my share. Reprints of this page, along with a personal letter, will be sent to every Senator and Representative in Washington. If every one of you readers will do likewise, civilian aviation will, at long last, come into its own in this fair land. It is definitely up to you!

A Lotta Scud . . .

Wonder if Shield No. 17655, N. Y. C., P. D., feels that he is really one of "New York's Finest" because he arrested Bernard Sturmock for driving a car with a model airplane tied on the top. (Sounds like rookie stuff if you ask me.) . . . Speaking of models, the danger of power-model flying is vastly overrated. The motor runs out of gas shortly after it leaves the ground. And, that airline pilot (who was doping along and thought a model was another ship in the distance), to the contrary notwithstanding, such a model floating around in a thermal air current would actually be *difficult* to hit. Also, and this for the benefit of the chief aero-nut up in the Nutmeg State, most of the power-models weigh less than a fat pigeon. . . It's kind of silly, don't you think, to have license requirements to talk over a radio telephone? (Another Department of Commerce inanity.) . . . The biggest thing that has come to Baltimore since the B. & O. railroad is the trans-Atlantic flying base. Yet I understand that the city dads in that grand town have yet to be taken into confidence of that big Icebox airline. . . Confession: I've grown to like air hostesses, and I take back all the mean things I ever said or thought. It was Miss Florence Pond, out of Chicago, who by her own splendid airworthiness showed me the error of my ways. (I'll never hear the end of this.) . . . Pretty dirty trick the Bureau of Air Cancerous pulled on Max Karant in not granting him a waiver to fly the safe Stearman-Hammond. Maybe it is just as well that Lawyer Fred Fagg decided to give up and go back to school. He was no help at all. . . Happy news about the Bureau, though, being that Leo Kieran, of the New York *Times*, will, by now, be holding down the post of Chief of Information. (Maybe the Administration has finally got around to us?) . . . That good old Gulfhawk, Al Williams, certainly called the turn on the North Atlantic flying monopoly. But it will never come to pass. (Too many people ready to turn Pan-American's damper down.) . . . Aviation writers the country over are rejoicing at the appointment of Major Ira Eaker to the Air Corps Information Section. At last well written, newsy items will be coming out of that office. . . And ask me some time about the part aircraft played in the four wars. The third one—the one that didn't start—is probably the most interesting and amusing of the four. It was another distinct triumph of the airplane, in that the nation that was ready saved many times the cost of its air force. (Likewise, the other fellow lost lots and lots of dough.)

Tribute . . .

Though somewhat belated, this department wishes to add its own sad song to the flood of threnodies occasioned by the passing of George Horace Lorimer, late Editor of the *Saturday Evening Post* and staunch friend of Aviation.

How good a friend he was the Industry never knew. Which is regrettable in the extreme. For, back in the bitter days when the struggle to demonstrate human flight was at its bleakest, any awareness of such a strong ally would have been a source of great comfort, if not actual courage. Yes, it certainly would have made the dawn seem less distant had it been known that America's greatest editor not only stood ready to extend a helping hand, but that he towered high against all efforts to minimize, or hurt, an industry sorely beset by growing pains.

To illustrate Mr. Lorimer's alertness against anything which might reflect unfavorably on flying an instance may be recalled when he insisted that a certain celebrated writer change a story situation which would raise the question of safety in flying. The situation had to do with the failure of an exhibition 'chute jumper's main 'chute to open. Yet regardless of the fact that the story was based on an actual happening, (nor did the emergency 'chute fail), George Horace Lorimer would not permit any of the perilous part of aeronautics to be projected in the minds of his millions of readers. If the story couldn't deal with the hopeful side of flying it never saw the light of day in his great magazine.

This correspondent, like everyone who ever wrote a syllable for George Horace Lorimer, feels a sense of deep personal loss. For, he was so thoughtful, so considerate of his writers. Rare man that he was, he actually knew that his contributors had to eat; hence your check was always mailed out the Monday following acceptance.

All of us like to feel that he loved us a little, even as we adored him. And you can bet your bottom dollar that the most scoffing cynic of the lot will, whenever the writing gets hard, find himself turning in spirit to George Horace Lorimer for strength and consolation. Thus will his soul go marching down through the pages of American literature as long as there is one of us left.

Happy New Year . . .

to each and every one of you! May you deserve rich blessings throughout every day and hour of 1938. Take good care of yourselves.

END

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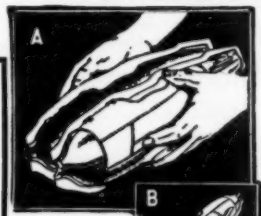

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Tomorrow's Airport

(Continued from Page 32)

lighter and slower than the "stratosphere ships" we are promised for transcontinental duty, and flying more frequent schedules. It will handle, also, airplane sales and demonstration activities, contract flyers, qualified private pilots and small seaplanes.

In the military picture, too, Treasure Island has a high potential. Unmistakably, the San Francisco Bay area is becoming the military aviation base of the central Pacific coast. Hamilton Field, just north, harbors the Seventh Bombardment Group of the GHQ air force; Moffett Field at Sunnyvale, just south, is an observation base. At Alameda, on the East Bay shore, title difficulties have been cleared and the way is now open for construction of the authorized $13,500,000 Naval Air Station to care for personnel and aircraft of three carriers and two patrol squadrons. Establishment of another Army air base near Sacramento, and of a $15,000,000 Naval Supply Depot at Oakland, is in the offing.

According to Brig. Gen. William E. Gillmore (AC-Ret.) the Treasure Island site has immense potentialities as a military airdrome and would, in a national emergency, undoubtedly be used jointly by Army and Navy. General Gillmore has pointed out the value of bomb-proof hangars, caverened out of the rock foundation of nearby Yerba Buena Island, as an impregnable protection for equipment on the ground during an air raid.

These water-level caverns would be vastly superior to the sand-bag walls, for protection from flying fragments, as suggested by T-2003 in the November issue of POPULAR AVIATION. The terrain is ideal, for seaplanes could taxi directly through the hangar openings and land planes could be transferred quickly across the mooring basin on barges, to take off from Treasure Island.

The Pacific Ocean and the western hemisphere are growing smaller. In their first year of service Pan American *Clipper* ships flew more than 7,000,000 passenger miles above open water, and carried 500,000 pounds of cargo. An expansion program that will give flying $30,000,000 in new facilities is under way in the San Francisco Bay area, central point in the hemisphere.

To celebrate this and other things, there will be a World's Fair on Treasure Island in 1939. Elaborate air shows, and perhaps the National Air Races, will be on the program, according to Frank W. Fuller, Jr., winner of the Bendix trophy in 1937 and chairman of the Exposition's aviation committee.

Then Treasure Island will settle down as a new grand central airport for the San Francisco Bay cities—not quite so central as the fabulous roof over the business district, but probably the most central in the world.

END

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Miss Bird

(Continued from Page 65)

tient and fly him to the nearest hospital and then return to Bourke, landing as close as possible to her patient. Her radius from Bourke was about 400 miles north, 210 miles southeast, 300 miles southwest and 400 miles northwest.

The risk of being lost is greatly increased by the fact that there are no landmarks, wirelsss, etc., and if forced down away from the road, it would probably be a long time before help arrived. Consequently, Miss Bird kept as close as possible to the roads where help might be obtained. Where this was not possible she flew by her compass.

"I was at the beck and call of everyone," said Miss Bird, "not knowing when I awoke in the morning where I would have lunch. Frequently after returning from a 300 mile journey expecting a rest, she would have to take off for some far away station 200 or 300 miles distant.

The average distance of her flights would be from 300 to 400 miles total distance. Once she flew from a country town 750 miles to bring a hemorrhage case from Ivanhoe, a settlement in the northwest corner of the state to a hospital 300 miles away and then back to Bourke.

"I had just put the bus away on one occasion, after a three days' inspection tour when I was informed that I had to fly 140 miles to pick up a pneumonia case. After landing at a station for directions, I flew my patient from his homestead to a hospital in Wilcannia, a distance of about 100 miles, in 40 minutes." To take the patient by road, the journey would have taken at least five hours, driving at a speed higher than 20 m.p.h. Along such roads as encountered in the far west of N. S. W., this would be very dangerous.

During hot weather, which is most frequent in western districts, the air becomes very rarefied. Breathing in a sealed cabin under such conditions becomes difficult. This, together with violent dust storms and heavy rain makes conditions difficult.

Besides her usual work, Miss Bird flew mails, food and other provisions to flood-bound people. After heavy rains, the rivers overflow forming huge lakes on the flat country which is then impassable. Therefore the only means of communication is by air.

While unoccupied flying for the Far West Health Scheme or flying provisions, etc, to some far away flood-bound center, Miss Bird used her plane as a taxi service flying sheep buyers, stock inspectors or station owners to outlying districts and bringing people into town from the flood areas.

Mosquitoes are the Public Enemy No. 1 in the west, even killing animals such as lambs and goats. The only means of protection during the summer months is sleeping in the smoke of huge fires all night.

END

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Test Pilot

(*Continued from Page 42*)

The Service has no intention of letting its members make sacrifices in vain. No fatality, no accident is without the most searching investigation that the whole world may benefit by what has been, to some, the misfortune of injury or even untimely death.

Captain John Griffith, World War ace with the British Army, now a member of the U. S. Army Air Corps, and Captain Irvin were pilots of the bomber which caught fire over Indiana one day and from which five civilian observers and lab men were forced to jump, the largest number of men ever to join the Caterpillar Club by jumping from one plane on the same occasion.

Griffith and Irvin discovered fire in their engines. They were unable to extinguish the flames. They ordered the civilians to take to their 'chutes. They then stuck with their ship, brought it into a landing with a minimum of danger and damage and breathed great sighs of relief. A ticklish job, but nothing a test pilot doesn't expect.

Harold R. Harris, ace test pilot for the Army after the war, made the first forced jump from a disabled plane undergoing a test flight. Harris, with a national reputation as a test pilot, was accustomed to almost any kind of a crate, considering what the early post-war years had to offer.

It is interesting to note that when he jumped at 2,500 feet on that cool October 20, 1922, it was nearly four years since the World War had ended, and up to that time nobody in the United States had ever saved his life by leaping from a plane with a 'chute to guide him safely to earth. Harris became the first man to do so in this country.

Historically, that is, back to the real beginnings of scientific test flying in the early 1920s, this dangerous part of the flying game has some most interesting recorded events. How would you like to have been Captain Muir Fairchild and Lieut. John A. Macready while they were sporting through the clouds with the ponderous, clumsy Barling bomber (1922), then the most gigantic plane in the skies? It had been test-hopped by the redoubtable Harold Harris and pronounced (under the circumstances), "suitable".

Major Rudolph Schroeder was test-flying a ship when he made his first altitude record (1920, 33,113 feet), and Macready was trying out a supercharger when he beat that record a year later. Lieut. Jimmy Doolittle proved, by daring acceleration tests at Dayton in 1924 that pursuit planes couldn't "take it" and might be dangerous to the point of falling apart if the safety factor were not greatly increased. It took plenty of nerve to make tests like these.

In 1925 the test hoppers were given their first trimotor Fokker (F-VII) to experiment with and the results of their efforts contributed largely to the rapid adoption of this type craft into general use. In 1929, Lieut. James S. Sutton completed such a dizzy series of spinning tests that the eyes of the entire aeronautical world were opened and he was awarded a Distinguished Flying Cross, something unique in aerial annals. Lieut. H. G. Crocker tested a ship one day in 1930 which caught fire. He managed to land it and save both motors. These are examples picked from the historical background of test flying.

Modest, unassuming Major Stanley Umstead, the flying branch's chief, is proud of pointing out that many other flyers have paced off milestones in aeronautical progress and achieved lasting fame through work which was closely cooperated in and even fostered by his branch.

One of the earliest of these was the flight of Lieut. Leigh Wade of the test branch who flew Capt. (now Major) Albert W. Stevens and an observer, Roy Langham, to a 24,200-foot altitude at which Stevens jumped.

The flying branch, Major Umstead points out, was instrumental in establishing the first scheduled night airways flying. With the branch's close cooperation, Lieut. D. L. Bruner successfully pioneered this tremendously important work. Apparatus for spreading insecticide from airplanes; preparations for some of the earliest transcontinental non-stop hops; blind-flying instrument experimental flights; more tests of scheduled night flying, during which Lieutenant Macready made the first night emergency parachute jump; test-flying radio beacon equipment, and countless other epochal achievements and accomplishments shoving the United States into world aeronautical leadership have been intimately associated with the flying branch.

Members of the test group of this branch are more or less noncommittal when asked about the dangerous side of their lives. They like the work; shrug at the hair-raising experiences, remark: "it's all in the game and maybe it isn't any more hazardous than other flying"; and leave you with the impression that you'll look elsewhere for your thrills or, at least, hope you don't get them as fast and regularly as these pilots do.

END.

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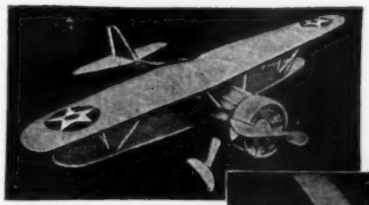

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Airy Chat

(*Continued from Page 9*)

and, from all estimates made up to the present time, it would seem that Mr. Leake is not only within the realm of possibility but that he is actually on the right track.

* * *

ROCKET engineers are plugging along as rapidly as their meager funds will permit which is not very rapidly. Some day, we hope, a capitalist of vision will properly finance the various rocket projects now under way and thus bring stratospheric operations to a final reality. In view of the great possibilities in rocketry, we are surprised at the apathy of both capital and the public in rocket developments.

* * *

Perhaps, if the inventors of the rockets labeled them aerial weapons, the manufacturers would pay more attention to them than they have done to date. The World War dragged the airplane out of obscurity and so we have hope that the next war will deal just as kindly with the rocket. I'll bet that there is a fine market, just now, for bomb dropping rockets in China.

* * *

OUR policy of isolation, while admirable in many respects, prevents us from getting a whole lot of actual warplane experience that is falling to the lot of other nations—also supposed to be neutral. France, Germany, Italy and Russia are reaping tons of useful data from the planes shipped into Spain by them while we are standing on the sidelines.

The wars in Spain and China, regretable as they may be, are serving as vast proving grounds for the major European plane manufacturers who are submitting design after design for practical test under actual military conditions. And it may be said that an ounce of test is worth a ton of theory.

It is one thing to design a military plane on paper with only test-hop data as a check on performance and still another thing to design a ship that adapts itself to any particular military mission under actual front-line conditions. The criticisms and suggestions of a fighting pilot are of far more value than a record of aerodynamic properties determined in wind-tunnel tests and peacetime maneuvers. And it is this information that we sadly lack at the present time.

* * *

WARPLANE effectiveness depends upon the adjustment of a great number of conflicting factors that can only be brought into harmony by actual battle flight data. The relation between horizontal and climbing speeds, the ratio of stability to maneuverability, the disposition of the armament, the weight distribution factor and many other factors depend upon actual demonstration under service conditions as we soon discovered during the World War.

And, of as much importance, is a full understanding of anti-aircraft developments which, by the way, have become very prominent in the Japanese-Chinese argument. Sensational developments in anti-aircraft guns are claimed by European manufacturers and this, of course, reflects directly into future airplane design.

* * *

REPORTS issued by the various accident prevention boards and committees fail to prove the superiority of metal over wood construction as a fireproofing. In accidents where fires have been the major cause of fatalities, it would seem that the all-metal type of ship is more dangerous than the wood veneer or wood monocoque constructions.

Metal framework and metal coverings do not greatly decrease the inflammability of an airplane structure, because the quantity of wood in any structure is relatively small, even in the veneer type.

The major hazard is the gasoline and this will burn regardless of the type of structure or the materials employed. Gasoline flames are just as hot in a metal frame ship as they are in the wood type, and generally exhaust themselves before the wood is consumed, thus bringing death to the passengers long before the woodwork has had an opportunity for contributing much heat to the pyre.

In a heavy crash, accompanied by flame, the all-metal members of the frame form a cage from which it is almost impossible for the passengers to escape, particularly when the structure is badly bent by the impact The wood frame, on the other hand, can be more easily torn apart by a rescue party, due to the softening of the glue and the warping of the wooden parts. The danger from flying splinters has been greatly exaggerated and is almost negligible in comparison to the hazard of metal caging.

* * *

SOME ONE is always taking the joy out of life. There is now a concerted drive on, sponsored by several of our most prominent meddling organizations, against the flying of gas models. Their howl is that gas models "might possibly cause severe injuries to persons and damage to property," but so far they have given us no specific examples of these holocausts. More people have been strangled with soup-bones than have ever been injured by gas models, so why not pass a law prohibiting the use of soup-bones?

* * *

AERIAL PHOTOGRAPHY is gaining ground as an outdoor sport. We have recently witnessed many very beautiful amateur shots taken from planes, both black-and-white and in color. The

towering cumulus clouds show up beautifully, particularly in colored sunset views where every rainbow color is reflected and counter-reflected among the cloud masses.

* * *

OUR first duty has always been to our readers and this policy has always been carried out by us in cases where controversies have arisen between our readers and advertisers. We exercise the greatest of care in keeping our advertising clean and, as a result, only the best and most reliable concerns will be found in P. A.'s columns.

However, a "gyp" advertiser may slip in for one issue before we discover his character, but we assure you that we will consider it the greatest of favors if you will report the delinquencies of such an outfit to us at the earliest opportunity.

These paragraphs are prompted by an annoying series of "stick-ups" experienced by the writer who answered a number of advertisements appearing in two very prominent popular type mechanical magazines.

These advertisers charged for their catalogues, which is perfectly correct and proper, but only six replies were received from a total of fourteen letters, each letter containing an enclosure of from three to 35 cents. In short, these irresponsibles victimized me to the tune of $2.36, not a great amount to be sure, but sufficient to be irritating and to create a distrust of this sort of advertising.

The publishers of these magazines were notified in the hope that they would do something to save the face of their many honest advertisers and the honor of semi-technical magazines in general. If you should receive this sort of treatment from any advertiser in POPULAR AVIATION let us know about it immediately and the matter will be promptly attended to with great pleasure.

* * *

MANY of our readers, especially those readers who use POPULAR AVIATION as a frequent reference, will welcome the news that we are now compiling a complete index for the year 1937.

It is so cross-indexed that you can locate any article by its name or by the name of its author under a general subject head. You have only to look for the proper subject head, such as DIRIGIBLES, LIGHTPLANES, AIRWAYS, etc., and then under one of these headings you can locate the desired story or feature photograph by its name or author.

* * *

IF you wish this printed index, it can be had late next month by writing to the Index Editor, POPULAR AVIATION, 608 S. Dearborn St., Chicago. There is no charge.

* * *

AND now, in this last paragraph, we wish you a most happy and prosperous New Year, with the further hope that you and I will both witness further progress and development in our hobby —aviation. J. B. R.

Popular Photography

(by the publishers of POPULAR AVIATION)

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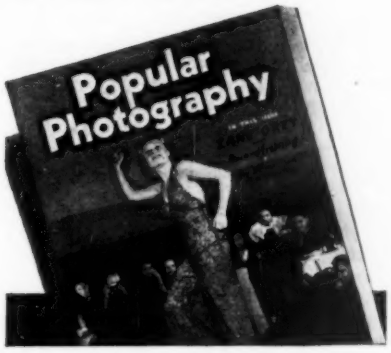

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The famous photographer tells how he makes his marvelous color pictures.

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A nationally known authority explains photographic makeup for the amateur.

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JANUARY

Popular Photography

NOW ON SALE AT ALL NEWSSTANDS

Export

(*Continued from Page 20*)

to Cuba, and will soon send a complement of the new two-place Continental-powered Model VPF-7 planes to Guatemala for military service.

Bellanca Aircraft has been shipping great numbers of their *Twin Wasp* powered Model 28-90 *Flash* planes to China of late and has others of the same type under construction for the same country. There is a great deal of activity in the Bellanca plant due to the Chinese orders and the building of a new type twin-fuselaged twin-engined pursuit-bomber for the Army Air Corps. This radical type will probably cause a sensation when it is completed.

Many other types of planes bearing military equipment have been exported from the United States in the last few months. These planes, when first constructed, were not intended for military use but were converted into planes of war by small exporting firms and sent on their way to give origin to or quell an insurrection.

Various foreign countries have obtained samples of American ingenuity in aircraft design and construction in the past few years and will continue to purchase these materials in future years with the knowledge that the United States has taken over the supremacy of the skyways.

END

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Training

(*Continued from Page 58*)

merce and company requirements as these become more exacting.

The airline pilot and operations course of two years' duration involving seven hours a day, five days a week of actual class attendance, is designed to meet the most exacting flight and technical training requirements. It involves 250 hours of supervised flight instruction, comprising seven stages and fifty-three flight projects, all of which must be satisfactorily completed before the student becomes eligible for a pilot's certificate.

Considerable time is also devoted to a discussion and study of flight problems involving a daily review of dual instruction and solo practice, the application of meterology and avigation to cross-country flying, the preparation of flight records, reports and log books, and close observation of airlines' passenger and airmail operations.

Technical instruction involves over 3,400 hours of lecture and shop work covering all subjects related to flying operations, as well as those which will enable the student to serve in numerous semi-technical capacities on the ground, should he become physically disqualified for flying or wish after a period of flying experience to engage in work which may lead to a position of executive responsibility.

The two-year airline pilot and operations course is especially recommended to high school graduates, since it is more than equivalent to two years of intensive college training. For students who have completed a minimum of two years at college, the one-year airline pilot course comprising the same flight training as the broader course described above, but only one-third of the technical training, will suffice. The two-year course, however, offers decided advantages, even to college men, in greater breadth and thoroughness of training and in preparation for positions of broader responsibility in the industry than are involved in piloting alone.

Young men who wish to make flying their career should give serious consideration to the training and technical requirements which must be met if success is to be achieved. Annually hundreds of students in their eagerness to get started and attracted by the romantic aspects of a pioneering industry, invest in poorly supervised, inadequate training, only to be sadly disillusioned when they learn in applying for positions that they cannot meet the exacting standards of education which have been set.

Quality and not price should be the determining factor in selecting a course of training; the cheapest training is likely to be the most expensive in the end, since quality is so often sacrificed to make a low price possible.

Students who are unable to finance a course equivalent to one of these outlined above should instead take an adequate ground course, and with it an amount of flying sufficient to give them an understanding of the pilot's problems and the ability to fly safely.

Young men who possess the qualities necessary for a good pilot will have no difficulty in finding some interesting phase of ground work for which they are adapted and in which their ability can be fully capitalized.

Age limitations play a part in determining whether or not one should take up air transport flying as a career. Twenty-seven is generally accepted as the upper age limit. Air transport companies prefer to take on younger men as co-pilots and the opportunity for realizing on the investment in training is likely to be decidedly limited for men over twenty-seven. This does not, however, apply to private flyers for whom there is no upper age limit, provided they can meet Bureau of Air Commerce physical requirements, nor does it apply to those who are interested in ground phases of aviation.

While not pertinent to this article, the importance of adequate training under expert supervision for the private pilot cannot be overstressed. Too many private pilots fail to realize their own limitations and those of the planes they fly, with the result that the accident rate, among pilots in this class has been appallingly high. Too little supervised instruction or too much self-instruction may lead to self-destruction.

First pilots on a scheduled air transport line must hold a scheduled air transport rating. To acquire this, they must have logged at least 1,200 hours of solo time, hold a transport license for the type of aircraft employed, prove their ability to fly by instruments under a hood before undertaking passenger operation and at least once every ninety days thereafter by a method specified in the approved section of the company's operation manual.

They must become thoroughly familiar with the airway, its aids and facilities before being authorized to operate on any division, by flying at least five round trips as pilot or co-pilot, landing at all terminals, intermediate stops and emergency fields, and using all the air navigation aids and communication facilities.

They must prove themselves fully competent in all phases of the particular operation, including the use of aircraft equipment, devices, accessories and other aids incident thereto. If flying multi-engine aircraft, they must satisfactorily demonstrate to the airline inspector their ability to maneuver such aircraft with authorized load with any one engine fully throttled at altitudes equivalent to those of the airports and/or terrain on the route to be flown.

The co-pilot is generally required to have a transport license. One holding

this license may log 50 percent of his actual flying time as a co-pilot or the full time during which he is the sole manipulator of the controls, provided, however, if it is in excess of 50 percent, the total time thus flown shall be certified by the first pilot.

When he has acquired 1,200 hours solo time, he is qualified for a scheduled air transport rating, provided he can meet instrument flying requirements and pass the special examination for this rating. He is then permitted to serve as a first pilot subject to the conditions cited above.

Opportunities for employment as co-pilots and pilots on air transport lines naturally vary with economic conditions. It is significant, however, that many more men have been employed in these capacities during the past five years than in the years preceding this period.

During this period aviation has experienced considerable expansion of service, many additional trips have been scheduled and on routes previously established it has become possible to operate faster and more dependable schedules, thanks to improvements in the design of airplanes, engines, and aids to navigation.

Economies in operations have been effected which with substantial increases in passenger, airmail and express loads and government recognition of the service which commercial aviation can render in peace and war will tend to stabilize the industry and justify the prediction that it is at the threshold of developments undreamed of a few years ago. Intensification of service between large cities in this country, as well as in others on the American continent, the establishment of trans-Pacific service now in the process of being realized and the fact that the airplane has no climatic, topographical or geographical limitations, and can operate over water as safely as over land, should encourage serious young men to enter this industry.

Advancement, after one has gained a foothold, will of course depend on the individual's personality, initiative, ingenuity, cooperativeness and ability to keep pace with technical developments.

It is obvious that a new and expanding industry will need men who are capable of advancing rapidly, since its own expansion is predicated largely on its having personnel who can fill the positions of responsibility which are automatically created when service is extended or intensified.

END

Carburetion

(*Continued from Page 64*)

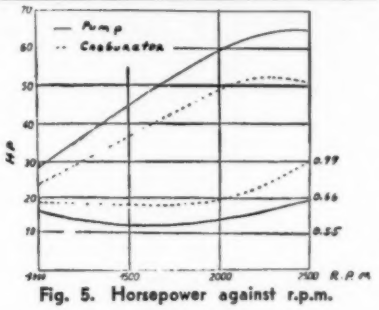

Fig. 5. Horsepower against r.p.m.

higher engine speed the condition is exactly reversed.

This then indicates that the consumption of injected-fuel is similar to that of carburetted fuel. Of course aircraft motors being always fully loaded—except perhaps at extreme altitudes—the increased fuel consumption at less than full load is of no moment.

For modern air-cooled motors, a compression ratio of 6½:1 is not uncommon and for water-cooled motors 7¼:1 has been reached. The before-mentioned experimental motor being supercharged, the compression ratio was held down to slightly more than 6:1, which made the motor's performance exceptionally smooth and pliable, clearly indicating that a higher compression ratio may safely be employed without fear of detonation.

As a matter of fact, detonations are the governing and controlling factors of any type of fuel supply system and we must regulate this item accordingly.

In conclusion it may be said that fuel pumps are rather costly when compared with the price of carbureters and hence their adoption for small low priced motors need not be anticipated for some time to come. But for high powered high duty motors, for transport and military uses, a carbureter is completely out-of-date, in that it is wasteful of fuel, does not permit the maximum possible power output and may also become a real danger under certain conditions, as stated at the beginning of this article.

END

Swedenborg

(*Continued from Page 60*)

"The higher a kite reaches, the less motion is needed to keep it in the air, while down by the ground more motion is necessary to raise it."

He discussed a plan for drawing the ship forward on rollers by ropes until it should leave the ground, and also considered pushing it off a roof in a strong wind. For, Swedenborg said:

"The wind can lift up very heavy materials, so that it can blow open a gate only 16 square ells in extent, even though two men be pushing against it. How then would it act on a surface of 150 square ells, with the oars helping along?"

END

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MAXWELL BASSETT
Correct in aero-dynamic design, perfect in structure and duplicating modern big-plane construction. Guaranteed to fly with any popular model airplane gas motor.
Complete Kit with Ready Made Balsa Ribs with Notches for Spars. Kit includes printed balsa, selected strip balsa, liberal quantities of nuts, bolts, hook-up wire, landing gear wire, washers, electrical connection, miniature wood screws, gas model cement, bamboo paper, colored tissue, celluloid, rubber, etc. Fully finished stamped metal nose cowling for front and sides with hinged hatch over motor. Large full size detailed plans with photographs and diagrams giving entire instruction for building and flying. Complete kit, less Motor and Wheels
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TRI-STATE COLLEGE

Aviation Adventure in Canada

(*Continued from Page* 14)

legs, his effort was wasted. "Why, it could run 80 miles an hour," he related with considerable disgust. "I didn't get near enough to even get his dust." Questioned as to how they managed to pass the time during the long month of waiting, Fortney replied:

"Oh, we were able to keep pretty busy. We had quite a nice walk to our woodyard, and then we had berries to pick—when they were in season," he added with a chuckle. "We worked for some time," he continued, "trying to coax a fish onto our line, before we decided there were no fish in the lake, and then we turned our efforts toward the land. We wre always on the lookout for anything which might serve as food, and in that country it was *real work* to 'bring home the bacon.' For recreation, we played checkers," he concluded, and when surprise was shown, he hastened to explain that their checkers were the nuts off the old engine.

Fortney is one of those rare fellows who can see the funny side of life, even when in the tightest pinch. The story is told of him, that, when flying at an altitude of nearly 8,000 feet, his plane hit a down-draft, causing it to plunge about 3,000 feet earthward in less than a minute. Hurriedly, Fortney buckled on his parachute, ready to bail out, then helped his companion to strap his on. At this moment he discovered that his own straps were crossed.

"Well, burn me up; this is apt to take ten years off my life," Fortney is said to have muttered; but his plane levelled out again at an altitude of around 3,500 feet.

When Coleman and Fortney were missing for five days from the R.C.A.F. camp, after delivering Hornby's engine, the party became genuinely alarmed, and a thorough search was started, First of all, Flight Lieut. Wray, who took charge of the rescue party of eight planes, mapped out an area of 300 miles each way from this lake. In eight-mile stretches they flew back and forth and across this mapped portion, battling against terrible weather conditions to make observations and report them at headquarters. Many times during the search, tired eyes saw white tents and airplanes, but when binoculars were brought into action these proved to be light-colored rocks and deceptive shadows. Pilot Walker of the R.C.A.F., however, spotted the empty gasoline drum left at Lac de Gras and found the note tied to it. The majority of the party thought they should follow south as the note suggested, but Pilot "Matt" Berry, a thoroughly experienced northern flyer who had joined the rescuers, had ideas of his own.

It was back in 1925 that Berry made a name for himself when he took part in a week-long search for two lost prospectors, just west of Chesterfield Inlet. He knew that north country as well as anyone, and also some of the difficulties these young fliers might have to face. He knew that the presence of metal, such as the old engine they would endeavor to freight out, would play havoc with their compass; that, when flyers were left to their own judgment for direction, they invariably pulled off to the right. Hence it was, that Pilot Berry, heading his plane in a northwesterly direction, found the lonely little camp on the shore of Point Lake, on September 17.

After a light meal of hot milk, the two weakened men were flown back to Fort Reliance where a doctor took charge of them. In a few days' time they continued on the last lap of the journey south to Edmonton, where they entered a hospital for further rest and special treatment.

Just in time the rescue was made. The young flyers, knowing that they could not last much longer in the face of the early approaching winter, had decided to conserve what little strength remained, and had rolled themselves in their eiderdowns to wait for the hoped-for rescue—or death.

What thoughts were theirs, in those last hours of doubtful waiting, we can only surmise, but of one thing we may be sure. With the presence of the humorous Joseph Fortey—"Joe Fortey-Five-and-a-Half," as he is sometimes called, the spirit of that brave little pilot, Sheldon Coleman, could not sink below the zero mark, even in the face of ultimate death.

END

Caterpillar Tales

(*Continued from Page* 24)

CADET LLOYD EYRE, with Private Marvin Cranfill as observer, was diving his plane when the rudder came off. His passenger thrown clear, he himself jumped.

While diving at 220 miles per hour, Eyre moved the throttle to the full off position. The rudder pedals started to vibrate at a high speed. As he tried to level the plane off the vibrations increased. After a few seconds the vibrations seemed to shake something loose.

Everything seemed to snap. The tail was torn loose, and snapped off at the rear cockpit. Cranfill was thrown into space and having opened his 'chute he descended slowly. What was left of the plane fell into an inverted spin and Eyre was momentarily stunned.

The dive was started at 10,000 feet, and the wreckage had fallen about 3,000 feet before he had regained consciousness. At this time he did not know the condition of the plane. He still thought that it was intact. Opening the hood, he loosened his safety belt. Centrifugal force flung him out forcefully. A little trouble was experienced in reaching the rip cord. He finally got it and yanked it with such force that it flew out of his hand.

END

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The National Air Board Says—

(*Continued from Page 34*)

regulations and the rules issued by the airlines take care of this point adequately. If accidents happen it is because beacons may give the pilot an erroneous indication of his position and because sometimes it is actually safer to fly lower. Perhaps the very best statement of the entire position came to the Air Board in the form of a letter from Dean C. Smith, an experienced and competent airline pilot. We quote from it:

"First let me say that the number of accidents has been decreasing in ratio to the amount of transport flying. It is hard to realize the increase in scheduled passenger flights within the past few years. Each year has seen near doubling of the business of the year before until this past year, which increased about the same amount as the year before. Also the percentage of flights completed has increased tremendously—meaning that flights are completed more and more regardless of weather. Had the ratio of accidents to total flying remained constant we would be having a fatal crash once a week. We have been improving and there is more reason than ever to believe that we shall continue to improve.

"I do not mean to say that the majority of the accidents have not been preventable and I do think that the establishment of means to prevent their occurrence in the future has progressed with distressing slowness.

"At least three quarters of our modern transport accidents fall into one class, that in which the pilot crashes due to a wrong belief in his position, either by flying into hills or mountains that are higher than his cruising altitude when he believed he was well clear of them; or by letting down into ground of higher elevation than at the spot where he believed he was descending.

"The layman immediately asks, in particular about crashes such as the last one, why the pilot does not fly at an altitude that will clear all the mountains. The answer is that he does when he can, but there are times when to do so is more dangerous than to fly lower. All that goes up must come down, and as the airports are lower than the tops of the mountains he must know his exact position when he does descend. There are times when flying higher than all mountains means a sure loss of position, when snow static, ice, etc., affect him at that altitude but not at a lower one, places where swinging beams and lack of cross checks mean a greater hazard in flying instruments high than in flying contact lower. In these areas pilots by necessity grow to depend on their individual skill and judgment as they lack exact means of navigation. They have repeatedly, by the greatest of skill and the highest use of their faculties, successfully completed trips under the most difficult conditions. Under such circumstances it is impossible to expect all the pilots to have infallible judgment at all times, and sometimes a crash results.

"We can all of us do such sums as two plus two to the correct answer one hundred percent of the time, but who of us—even if specially trained for years—could give an always correct and quick answer when asked to multiply 36,941,-603.75 by 7,777.07 while engaged in balancing a billiard cue on the end of his nose and juggling three oranges in his hands?

"How to prevent these accidents is to keep the problem of the pilot in the two plus two class. The first step is to give him the means of ascertaining his position at all times without doubt.

"The immediate answer is more and better radio ranges. It has been found that the consistent effective range of a radio beacon is not more than 40 miles. Within this distance power is effective in piercing static and fading and swing is not so pronounced. It has been demonstrated that to navigate with precision a pilot must have a cross check at least every hundred miles and preferably every 75. Let us then have ranges spaced within 75 miles on all airways.

"The blame in large part must be laid to the fact that we have had no increases in our radio aids to navigation in the last five years and our airways are antiquated and obsolete. The airway and air transport supervision is also far from being adequate."

COMMEMORATING THE FIRST FLIGHT

Augustus Post told the Board that the International Women's Association for Aeronautics is planning to hold annually, on December 17, an anniversary of the first airplane flight with a specially arranged commemorative flight from coast to coast with some of the best machines and best pilots participating. The Air Board voted unanimously that it would extend to the International Women's Association for Aeronautics any help that it possibly could.

RENEWED PESSIMISM ON THE ECONOMICS OF AVIATION

At a previous meeting, as our readers may remember, the Board received both a pessimistic and optimistic outlook on the financial condition of the industry. Frank Russell unfortunately brought confirmation of the pessimistic view. He also stressed the long time elapsing between an experimental order and the production order; the low wages prevailing in the industry at present, which must eventually be raised and rightly raised, but would still bring an additional burden on the manufacturers; the uncertainty of the air transport industry. The uncertainty is all the greater in regard to the possibilities of increasing popular flying.

A PREVIEW OF THE NEW AIR TRAFFIC RULES

Chapter 60 of these air regulations was presented to the Air Board by Grove Webster. The resolution offered by Lt. Richard Aldworth stressed the serious and strenuous efforts made by Fred D. Fagg, Air Commerce director, who in conferences with representatives in the industry has for many months been most careful in the promulgation of these rules.

But, while the resolution regarding sincerity of effort was unanimously passed, several members voiced severe criticism of the new air traffic rules. They are comprehensive and cover many contingencies, but they are couched in semi-legal phraseology and involve a complexity and mystery. Here is a typical definition:

"60.106. Green Zone of Intersection: A green zone of intersection is a zone of intersection on a green airway in which through traffic on a green airway continues through such zone at a constant altitude, and in which zone traffic on the intersected amber or red airway shall proceed as outlined in CAR 60.58310 and 60.58320."

Will the private flyer, no matter how good he is as a pilot, know precisely what CAR 60.58310 and 60.58320 means? Then we note that there are red, green, amber and other airways. They are all listed geographically and with increasing width, the number of airways cover almost the entire country. Rules like this appear:

"60.58321. Through Amber Zone of Intersection—An aircraft flying along a red airway and continuing flight through an amber zone of intersection shall, while within an amber zone of intersection, maintain an altitude 500 feet higher than the altitude approved for flight on the red airway being followed and, upon leaving an amber zone of intersection,

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shall assume an approved altitude prescribed for the new airway to be followed."

Does this mean that the private pilot will have to know all the airways by heart and will have to depend on memory precisely what he is to do at every point of the country?

Flight plans must be submitted to Airway Traffic Control, giving name of pilot, point of departure, point of first landing, proposed cruising altitude. Does this mean that nobody can in future take a jaunt from any controlled airport without going through a complicated filling out of forms and securing of permission?

There are listed controlled airports, controlled zones, controlled zones of intersection, center of controlled zone of intersection, zone of intersection priority, rules regarding instrument flight, over the top flight, weather minimums, etc., etc., etc.

These traffic rules which are tied up with the comprehensive civil aviation of regulations of 60 chapters or more, may indeed form no obstacle to the airline personnel whose job it is to study all such rules and to be acquainted with them in the most thorough and professional manner.

But does the private flyer have to make an equally intensive effort to keep going? If he does, then he will have to develop into more of a sky lawyer than the traditional sea lawyer. Will this mean good-bye to private flying of any character, or at least its very severe limitation?

Grove Webster reassured the Air Board by saying that in a very short space of time the Department would issue a small clarifying pamphlet clearing up these apparent difficulties and making life much easier for the private flyer.

May this clarifying pamphlet come at the quickest possible moment.

Promoting safety is all very well, but it seems unnecessary that promotion of safety should be accompanied by the disappearance of popular flying.

END

Cloud-Hoppers

(*Continued from Page* 54)

Kenneth Benson, president of the Cloudhopper's organization, made the following statement regarding the accident to the plane, which belonged to more than 25 university students who shared it equally.

"We are going to carry on regardless. We don't know until after we have a meeting just what disposition will be made of the wreckage of the plane—whether we will try to have it repaired or get a new one. It was an unfortunate experience and must be marked up to just that—experience.

"I am glad that both of the boys are going on with their flying anyway."

Young Easton's flying career will be held up several months, however, since he is now in a cast for his injured spine.

END

500 Miles for $4.72

(*Continued from Page* 56)

easy flying along the Lake. I passed over Toledo without stopping and set down at Wayne County Airport, Detroit at 6:05. I was tired and hungry and impatient to reach Bishop Airport, my destination, at Flint, so waited only to get gas. This should have been the simplest part of the flight but wasn't.

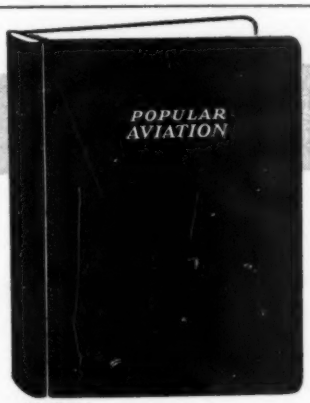
I had no map of Michigan nor, as I've said, a compass, and there was no river nor high tension line to follow. Furthermore I was very tired. In fact, I believe I must have dozed for the next I remember was checking my time at 7:30 and realizing that I hadn't sighted Pontiac, 30 miles from Detroit. I knew I was lost. After a while I sighted a town and flying low over it found the name, Howell, on a roof top. I was not acquainted with this part of Michigan so flew southwest along a highway and decided to land for it was getting dusk. I hedgehopped until I found a hay field with the hay cut once around the edge. I sat down and stopped with a 60 foot roll near a house. Immediately a number of farm people came hurrying out. They had thought I was going to hit the fence. One of them found a Michigan road map and showed me that I should head northeast for Flint. I decided to take off. Fifteen miles farther my engine quit. I was out of gas flying at 1,000 feet and it was getting dark. I could see a field which looked suitable for landing but couldn't tell what it was really like. But I had to come down so into it I went. It was thick timothy hay.

Again I was close to a house and the people came out to help me. Three of them drove off to get me gas while I studied out how to get out of the field. The gas they brought was ordinary automobile gas which has too low an octane rating for my airplane engine but I put in three gallons and tried to take off.

Twice I sashayed across the field trying to get off but each time the timothy slowed me down. Finally with the help of the farmers I pulled the plane backwards into an orchard, had a man hold each wing while I gunned the motor wide then had them let me go. This time I want down a little hill, across a hollow, bounced on a little ridge, bounced again on the top of a little rise and was off. I was so tickled I made a vertical bank close to the ground, zoomed across the hayfield, made a sharp climbing turn and headed for Flint where I landed at 8:40 and with 33 cents in my pocket.

Don't let any one tell you you can't get around with a lightplane.

END



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Lightplane Battle

(Continued from page 21)

it. With a roar an Aeronca hurled itself at the "50," and the metal ship went to pieces. A Porterfield zoomed over a *Cub* and let a bomb fall on it as the *Cub* pilot tried to get into a spin. A *Knight Twister*, with its struts blasted by shotgun fire, folded its wings and fell like a rock with the pilot hanging on a silk canopy above it.

On the earth below, a mad inventor pressed a lever creating a static that grounded all the sparkplugs in the sky above. With dead motors the ships came in to land. Some fast, some slow, some like a brick and others like a feather, but all equal now with dead motors. On the ground peace was restored and the manufacturers agreed to fair competitive business operations.

Hockshops were crowded with shotguns and machine guns the next few days.

END

African Air Saga

(Continued from page 48)

misfortune again overtook them. The second *Silver Queen* met the fate of her namesake when she crashed into the bush while taking off.

Yet a third machine was supplied—a DH-9, called the *Voortrekker*—and in this the pilots reached Wynberg aerodrome at Capetown on March 20. The route from England to Capetown had been opened and South Africa placed on the aviation map.

Imperial Airways, today, operates a service between South Africa and England which occupies about 8½ days, and shortly, when the new Empire scheme comes into operation, the flying-boat service will take but 4½ days. Yet the pioneer flight of the *Silver Queen* and *Voortrekker*, in spite of the long period occupied, even today holds many aspects worthy of admiration.

The flight across the Mediterranean, for instance, occupied more than 11 hours—almost as long as it took Alcock and Brown to fly the Atlantic. The latter used a machine exactly similar to the *Silver Queen*, so that one begins to get an idea of the conditions under which van Ryneveld and Brand had to struggle through.

It must also be remembered that they were flying over totally unknown territory with climatic conditions of which nothing was yet known. Their engines were water-cooled and could not give the maximum of satisfaction in the extreme tropical heat, and for this reason all attempts—there were several—made before that of the *Silver Queen*, ended in crashes in Northern Africa.

Van Ryneveld and Brand had proved, conclusively, that aviation was not only possible in South Africa, but an air service could well be established.

At about this time, the Solomon brothers commenced operations in the Cape Province, with their company, Aviation Limited. They met with lack of support, and when, at length, public interest began to awaken, they had already decided to cease their activities.

But Major Allister Miller, who had made a similar effort as far back as 1919, still held the conviction that the country could be made airminded. His efforts led to the establishment of the Johannesburg Light Airplane Club in 1927. More clubs were formed and another airmail service came into being, operating experimentally between Capetown and Durban, but this, too, had but a short term of existence. And so, on August 29, 1929, Union Airways, Ltd. saw the light of day.

Meanwhile the flying clubs had, with the exception of the Johannesburg and Germiston clubs, been disbanded owing to lack of support. Civil aviation was thus enjoying but little encouragement, but Union Airways continued their services. Public support was lacking—it was a new venture, and besides building up a service it had to school the population until public trust could be gained.

In spite of many setbacks, however, the company trudged on, and on September 7, 1931, the control of civil aviation in South Africa was placed under the Department of Defense. A Civil Air Board was established, with Sir Pierre van Ryneveld as chairman, which would henceforth regulate civil flying in the Union. Aviation had come to stay and South Africa was becoming more and more airminded.

Aviation in South Africa is alive today. There is a network of internal air-services; there are two services weekly to England and back; a coastal flying-boat service is shortly being inaugurated and there is a possibility that a Zeppelin service from and to Europe will come into being before long.

END

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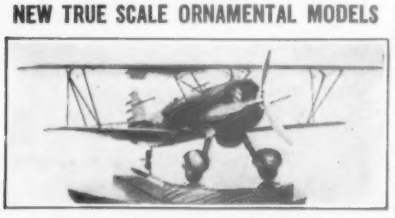

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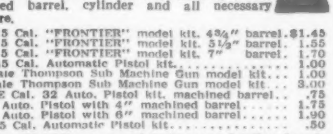

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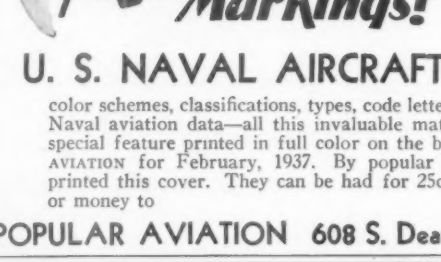

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The Man Under the Hood

(*Continued from Page 32*)

The British Royal Air Force is testing its newest and most powerful aero motor in an American airplane. . . . None of the current British planes were considered sufficiently well built to stand the strain of being jerked around by 1,400 h.p. . . . The engine is a Bristol 14-cylinder two-row radial called the *Hercules*. . . . The airplane is a specially built Northrop A-17.

* * *

The Navy department has taken a dog-in-the-manger attitude on one of its latest radio gadgets that the inter-airline radio committee for the commercial operators is very anxious to put into service . . . the gadget is an invention which takes simultaneous bearings by radio from several ground stations on a plane in the air. . . . The airlines want to establish about 20 of these bearing taking stations around the country to serve the civil airways, but the Navy says: "No! This Is A Military Secret!"

If these stations were established, a plane need never be lost so long as the pilot could communicate with the ground . . . and weather static, snow, rain, ice and dust static doesn't seem to affect short wave radio used for communications as much as the longer wave stuff of the radio range stations.

All a pilot need do if his range receiver began picking up so much static the signal was drowned out would be to send out a call for bearings. . . . Within two minutes three or four of the stations could take bearings on the plane. . . . The ground crews could plot its position and report to the pilot thus, for instance: "You're drifting way north of your proper course and getting into the mountains. Fly a bearing of 240 degrees magnetic."

Then the ground stations could conduct that ship all the way to a safe landing . . . the worst part of this picture is that the airline technicians worked out the simultaneous bearing system separately from the Navy. . . . They admit that the Navy's works a little better than theirs, but say that the system could be perfected if put into use . . . this the Navy forbids.

How many of the accidents of the last 12 months could have been prevented if such stations existed? . . . Should military secrets prevent the sound growth of a great commercial industry such as air transportation?

* * *

There's another big scramble on in Washington over the job Fred Fagg is going to leave within the next six or seven months. . . . Probably another lawyer will take the post with a technical man like Howard Rough, to head up that side of the department. . . . It's a 2-5 bet that Col. Monroe Johnson doesn't last very much longer. . . . The colonel is a bit crude even for the New Deal.

How do you think the great race between the Boeing and the Douglas aircraft companies will end? . . . Each company is striving to get its four-motored commercial transport flying before the other. . . . Boeing had a good start because of its military contracts, but bogged down in a mass of difficult engineering when they put a big fat fuselage on the military bomber wing. . . . Douglas started very slowly, but they're coming now with a rush. . . . Watch for the rival publicity about Jan. 15th.

* * *

At last, the student pilot gets a break with an insurance company. The Equitable Life Insurance company announced recently that the "bars are down" so far as they are concerned. Now, it is understood, the student pilot can get insurance at no extra premium which covers all flying—except that behind the controls of his own ship—providing he does not fly his own airplane regularly. Flying as an airline passenger or regularly with a licensed pilot is okay. Insurance companies are becoming more and more air-minded. Most of them have taken airline safety for granted for several years. Insurance now can be purchased for individual trips.

* * *

Jackie Cochrane, who took third place in the Bendix race and set a new feminine world speed record of 293 m.p.h. in Detroit recently, doesn't like to be known as Mrs. Floyd Odlum. . . . She sent notes to 100 newspapers recently asking that she be referred to as Miss Cochrane . . . but the newspaper boys agree she's tops personally . . . she bought champagne for the gang in Detroit after setting the speed mark. END

James Ewing

(*Continued from Page 61*)

spectors are present at all races and violations of the rules are quickly punished. But in the excitement of racing, pilots—all good sportsmen—frequently send the rules to Hades, forgetting the penalties.

There is no prejudice against the sex to cut out women racers, but women seldom have the financial backing which enables them to compete in planes on an equal footing with men flyers.

All entries must be made with the approval of the contest committee. Women are handicapped by lack of fine equipment and have not enough experience to fly in the big races. So, few women own fast racing planes, yet every entry must fly his own plane in a speed trial for the approval of the contest committee. This is the ruling which eliminates so many of our best women flyers.

Best of all his work, Ewing takes great satisfaction in the knowledge that he is helping aviation. The boy who longed to fly has grown up to be the man who gives his work toward the benefit of aviation. Within the last five years the air race game has developed nearly all of the new improvements in speed. Some of these are the retractable landing gear, the streamlined engine, streamlined fittings, inline engines, supercharging methods for high speed and the low-winged monoplane. Supercharged engines have been developed by race pilots from 30 to 50 percent over the original speed of the engine.

The worst experience Ewing remembers has indirectly resulted in the best improvement of the entire race game. He had all the prize money in the bank—prize checks were written and signed—and the bank failed during the last day of the races. END

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Slots and Flaps

(*Continued from Page 64*)

that apply to landing any airplane regardless of type or loading. The glide must be made at a speed to provide a sufficient margin of safety against inadvertent stalls and to provide sufficient kinetic energy for leveling off. Normally, this speed is about ten miles in excess of stalling speed. Leveling off must be started off at sufficient elevation to enable the airplane to attain a normal landing attitude. When the pilot fulfills these conditions he will make a good landing regardless of the type of plane or loading. The pilot will find marked differences in attitude and glide angle of planes equipped with high lift devices. Much confusion can be avoided if the pilot will glide his plane with regard to stalling speed and disregard the attitude. A plane with full span flaps and no slots will be nosed well down in a normal glide and allowance must be made for the additional time required to rotate the airplane to a normal landing attitude. The steep nose down attitude in a power off glide is characteristic of full span flaps. The attitude is less steep with partial span flaps and it is about normal with planes equipped with both flaps and slots.

It is readily apparent that a knowledge of high lift devices is essential to the pilot of the modern plane in order to efficiently operate his plane. As new planes come out equipped with an amazing array of gadgets that all add to the efficiency and safety of operation, the pilot is called on for an increasing amount of technical knowledge.

END

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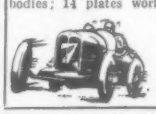

RAY F. KUNS, Dept. EE-I, Madisonville, Cincinnati, Ohio.

Statement of the ownership, management, circulation, etc., required by the Act of Congress of March 3, 1933, of Popular Aviation, published monthly at Chicago, Ill., for October, 1937, State of Illinois, County of Cook. Before me, a notary public in and for the State and county aforesaid, personally appeared A. T. Pullen, who, having been duly sworn according to law, deposes and says that he is the business manager of the Popular Aviation and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, W. B. Ziff, 608 S. Dearborn St., Chicago, Ill.; Editor, B. G. Davis, 608 S. Dearborn St., Chicago, Ill.; Managing Editor, J. B. Rathbun, 608 S. Dearborn St., Chicago, Ill.; Business Manager, A. T. Pullen, 608 S. Dearborn St., Chicago, Ill. 2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Ziff-Davis Publishing Company, 608 S. Dearborn St., Chicago, Ill.; W. B. Ziff Co., 608 S. Dearborn St., Chicago, Ill.; W. B. Ziff, 608 S. Dearborn St., Chicago, Ill.; B. G. Davis, 608 S. Dearborn St., Chicago, Ill. 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. 5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is ..... (This information is required from daily publications only.)
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Sworn to and subscribed before me this 1st day of October, 1937.

[Seal.] M. Gnass. (My commission expires February 26, 1940.)

Swiss Air Instruments

(*Continued from Page 46*)

There are over half a dozen firms in Switzerland which manufacture these watches (with or without chronograph combinations) and chronometers. One firm has recently brought out a special wrist watch for aviators with chronograph. By turning the covering glass, to give but one example, the exact starting time may be registered. This watch, although it is a first class product, only costs about 20 Swiss francs. This specialized industry has therefore also succeeded to produce articles which are as inexpensive as they are valuable.

Other specialties are revolution meters and speedometers. Both instruments are equipped with or without automatic registration appliances. One firm includes in its products the manufacture of altitude meters, also with or without registration, with a tolerance of only ± 1 percent. Another interesting specialty is a compass which is hung above the pilots seat, with a card on the under side. The magnetic needle moves in a special liquid having a particularly low freezing point, so that even in high and cold regions accurate indications are obtained.

In the autumn of 1935 a well-known firm undertook the production of distance thermometers and distance manometers for aircraft. These are important instruments for the supervision of the engines. The distance thermometer whereby the pilot by glancing at the instrument board may ascertain the temperature of the oil or water, was particularly helpful and constructive.

If one takes into consideration that the instrument board and the engines are often several meters apart, and that the corresponding connecting tubes are rarely entirely uninfluenced by the fluctuations of the outer temperature, it will readily be understood that former methods could hardly have given reliable indications.

These distance thermometers are therefore built as tension instruments. They function without quicksilver and consist of three component parts: a heat indicator, a connecting tube and a pointer. The heat indicator consists of a sealed tube containing a liquid which evaporates quickly and which plunges into the oil or water.

The evaporation of the liquid is directly related to the temperature. Through the action of the steam in the sealed tube on a pipe spring, the pressure, viz., the rise in temperature, brings about increased vibration of the spring.

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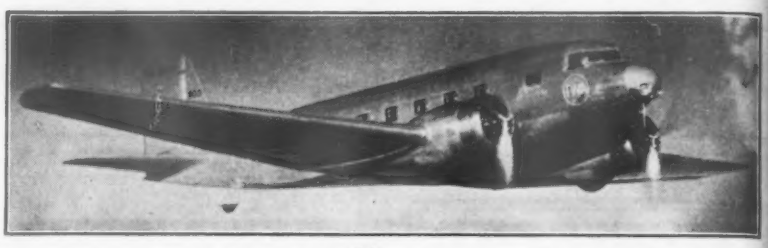

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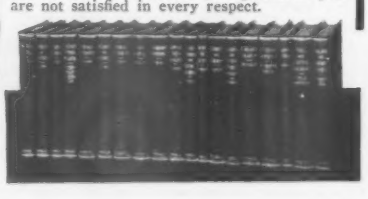

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